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)****.*

HTTPS://WWW.TECHOPEDIA.COM/DEFINITION/5225/COMMON-LANGUAGE-RUNTIME-CLR#:~:TEXT=

CLR (Common Language Runtime)

https://docs.microsoft.com/en-us/dotnet/standard/clr
https://docs.microsoft.com/en-us/dotnet/framework/get-started/overview

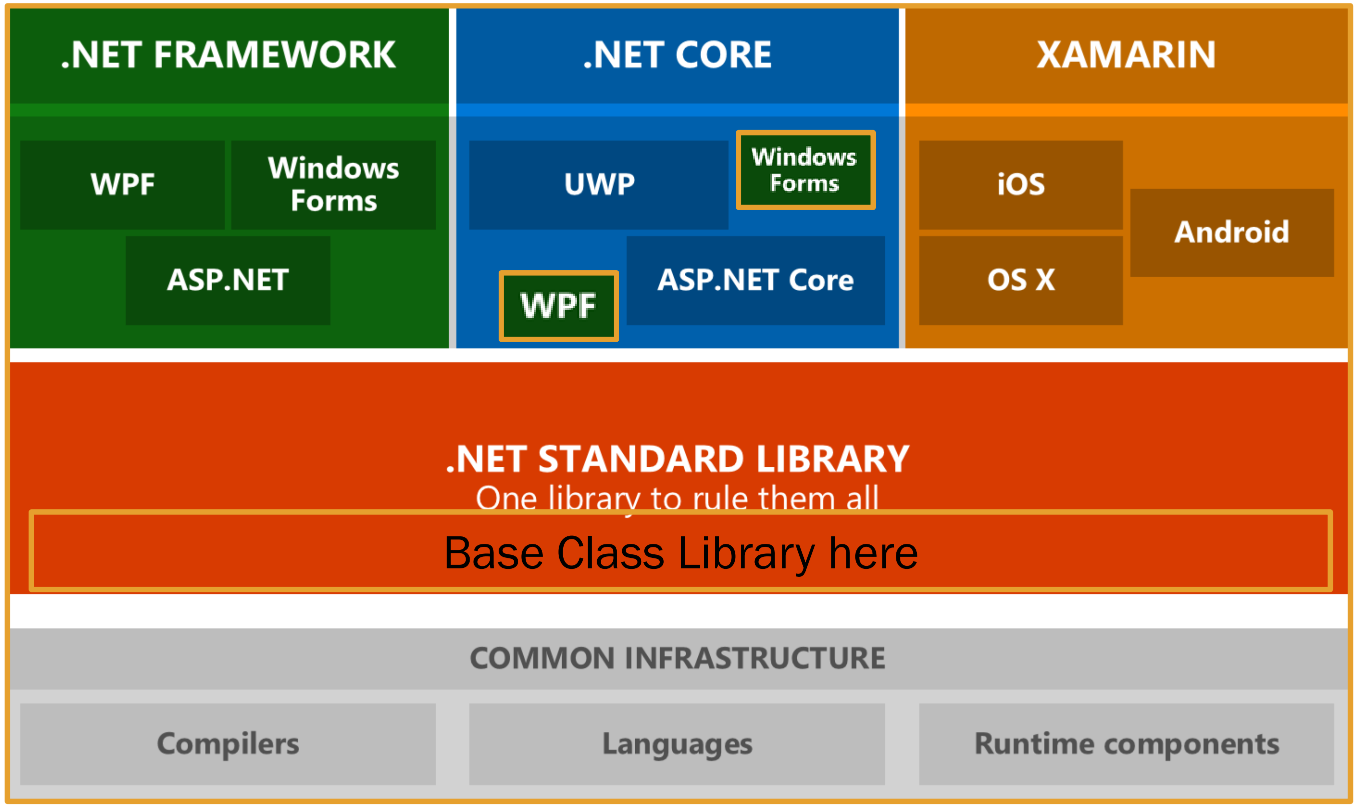
- The .NET Framework consists of the ***Common Language Runtime*** (CLR) and the ***.NET Framework class library***.
- The ***CLR*** is the foundation for .NET Framework. It manages and runs the code and provides services like memory management, remoting, type enforcement (through the ***CTS***), and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

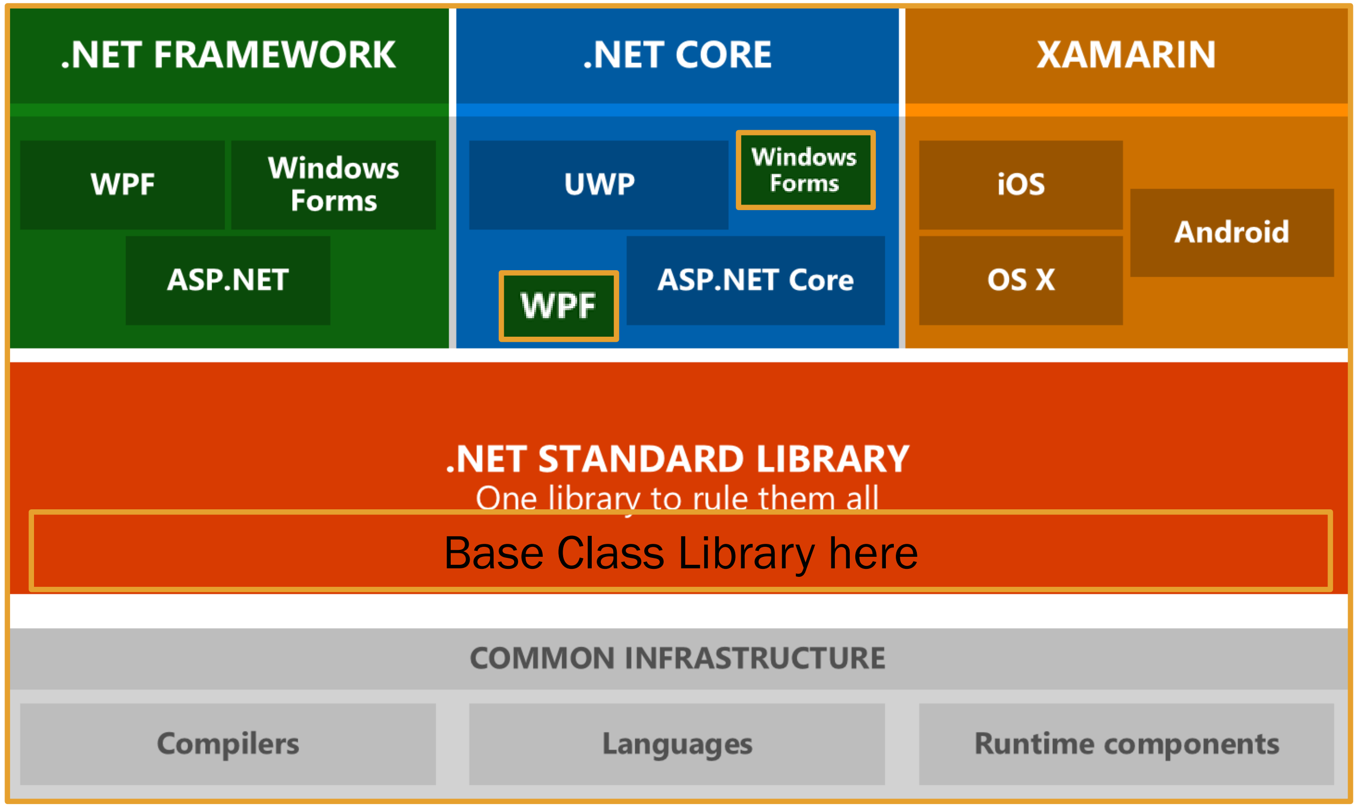


BCL (Base Class Library)

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.

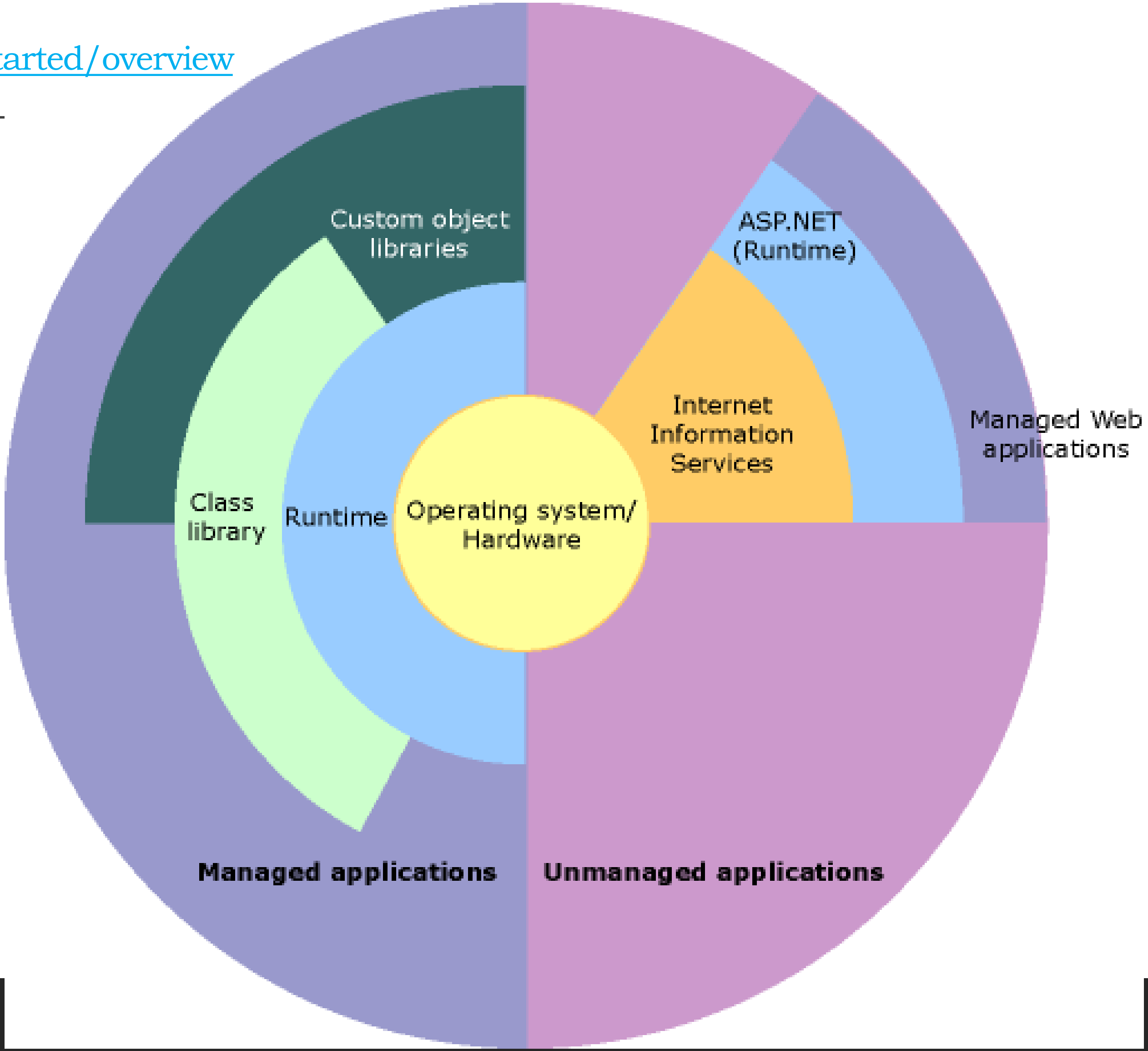


Base Class Library here

.NET CLR and Class Library Relationship

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

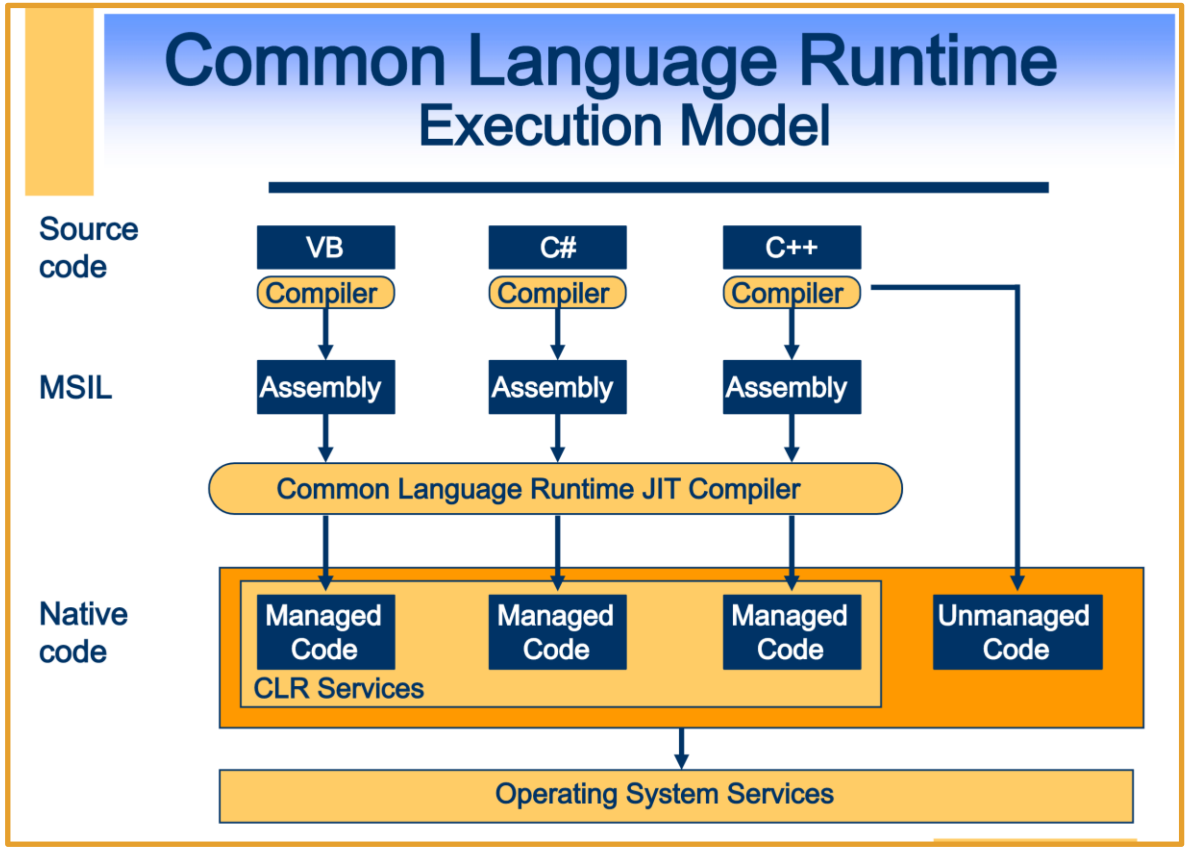
This illustration shows the relationship of the ***Common Language Runtime*** and the class library to your apps and to the overall system. The illustration also shows how managed code operates within a larger architecture.



Managed Code

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

- Managed code is managed by the **Common Langage 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

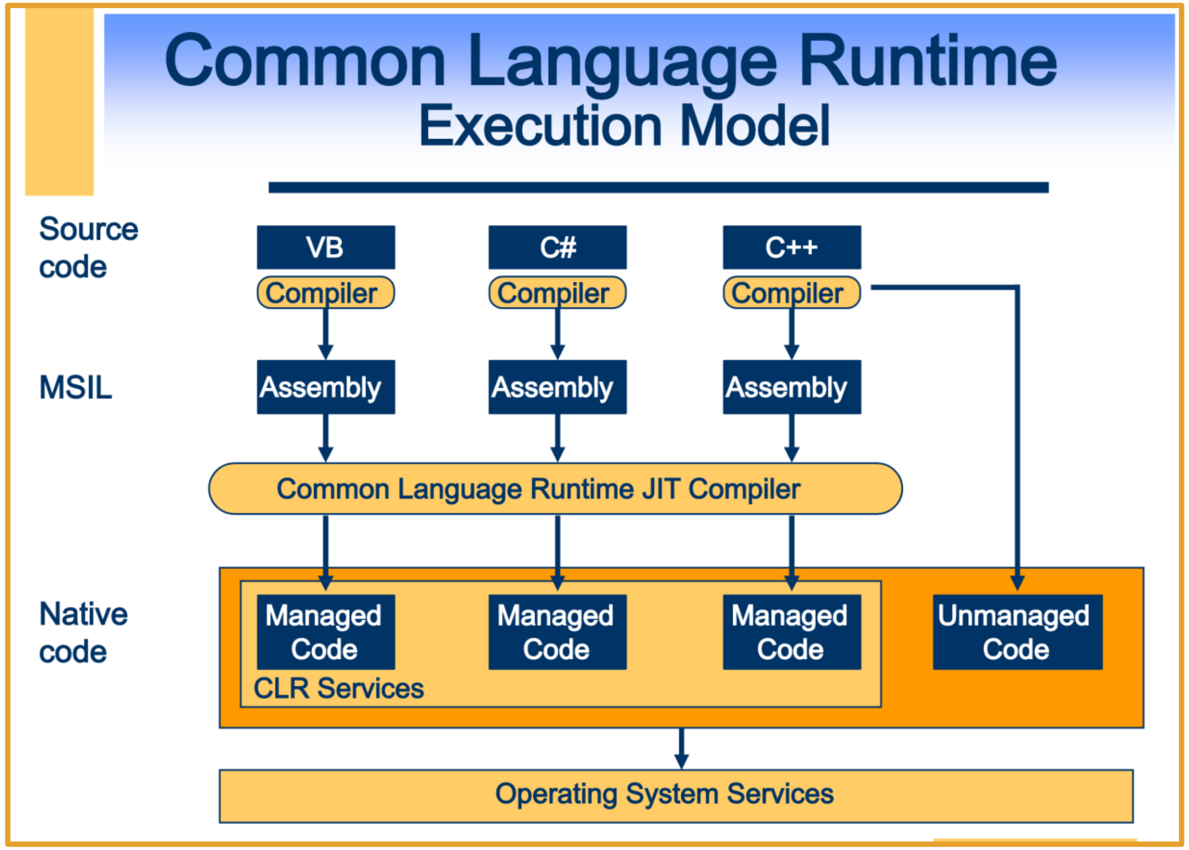
https://docs.microsoft.com/en-us/dotnet/framework/interop/

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:

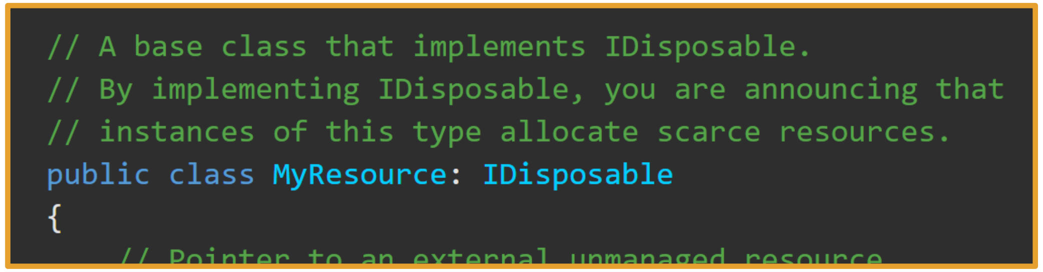
- COM components,
- ActiveX interfaces,
- Windows API functions.



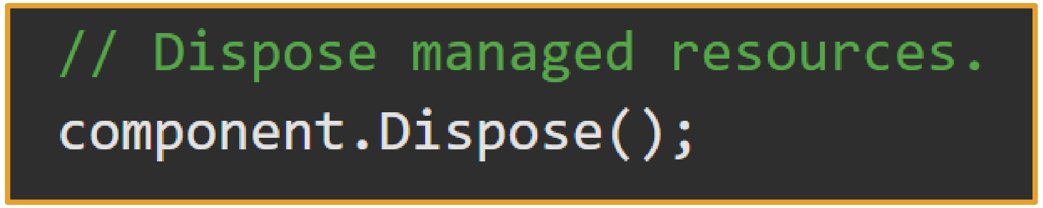
Idisposable Interface

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
```

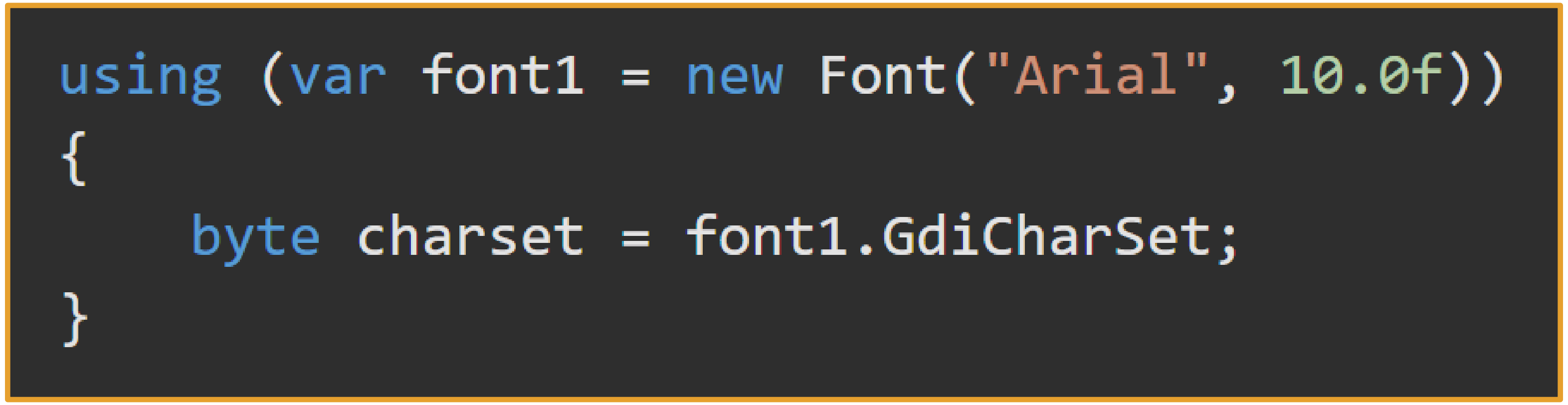


```
// Dispose managed resources.
component.Dispose();
```

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.



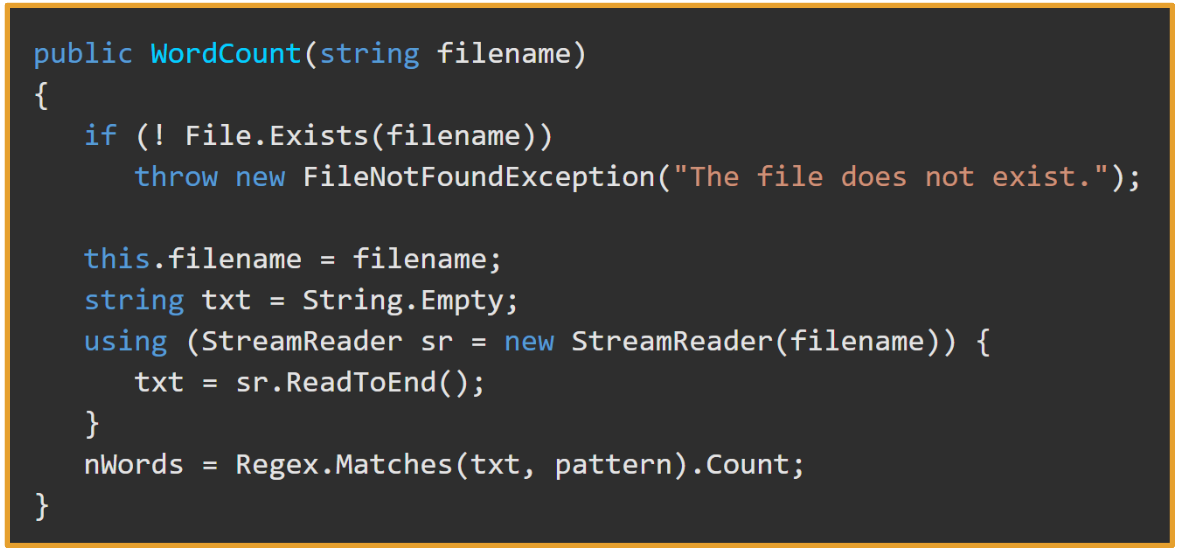
```
using (var font1 = new Font("Arial", 10.0f))
{
    byte charset = font1.GdiCharSet;
}
```

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;
}
```

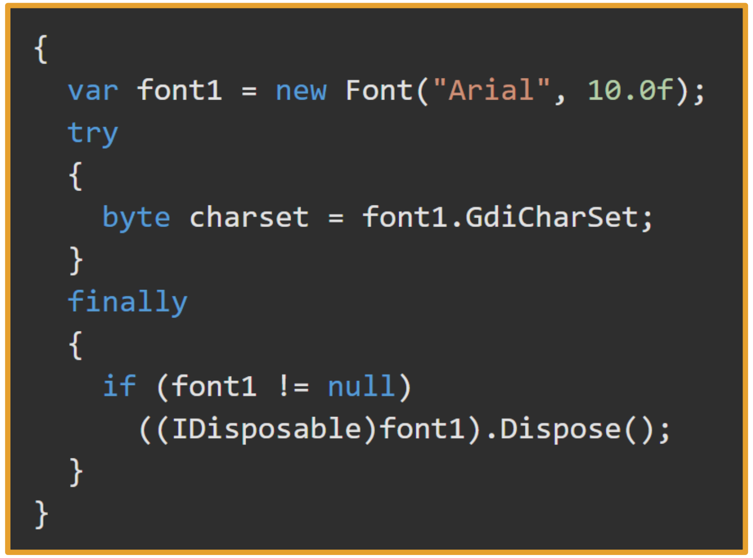
The using statement is a syntactic convenience. At compile time, the language compiler converts a using statement to a try/finally block.

using block

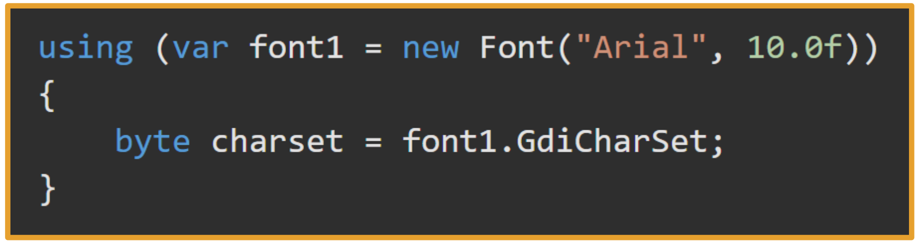
https://docs.microsoft.com/en-us/dotnet/csharp/language-reference/keywords/using-statement

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;
}
```