Common Language Runtime

.NET CORE

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.

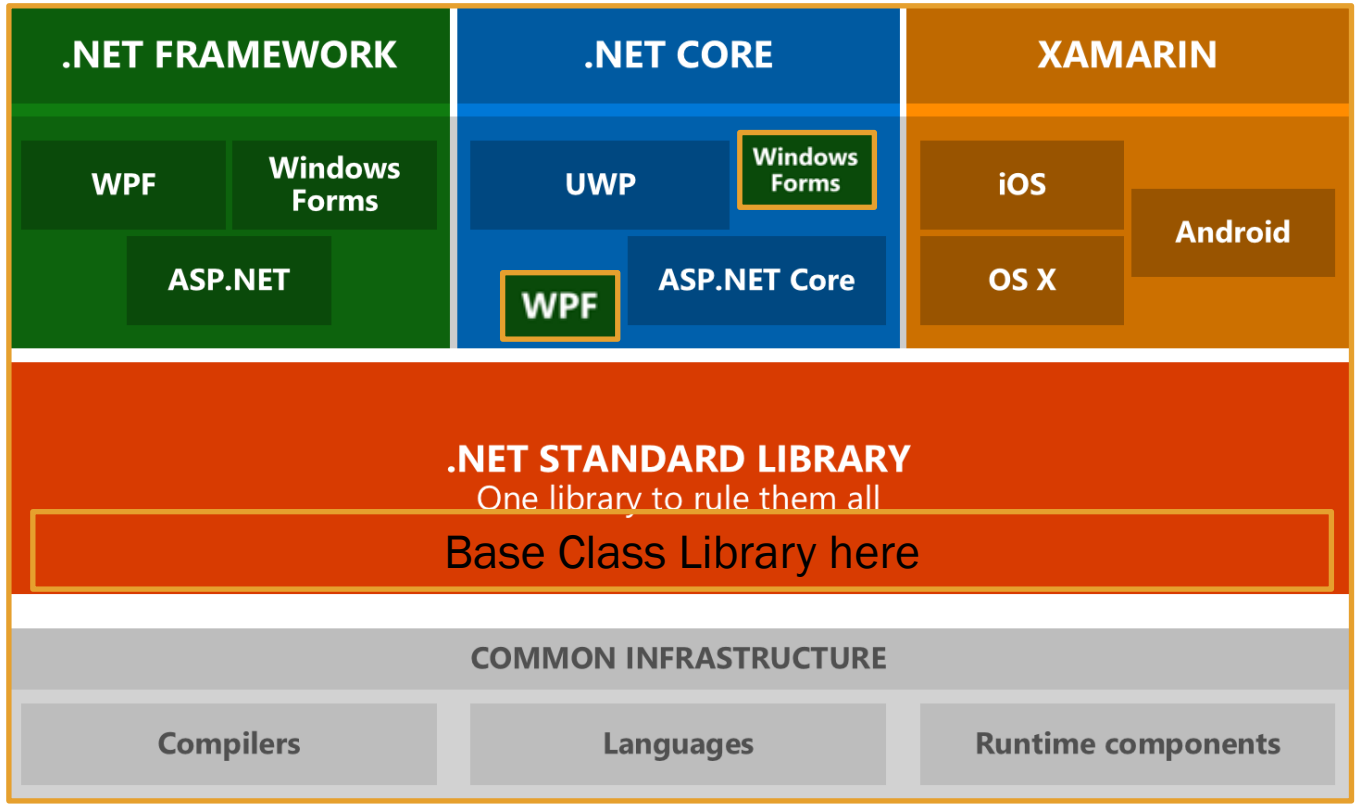
Benefits of CLR:		
cross-language integration	cross-language exception handling	enhanced security
versioning and deployment support	a simplified model for component interaction	debugging and profiling services.

.NET Class Libraries - 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.

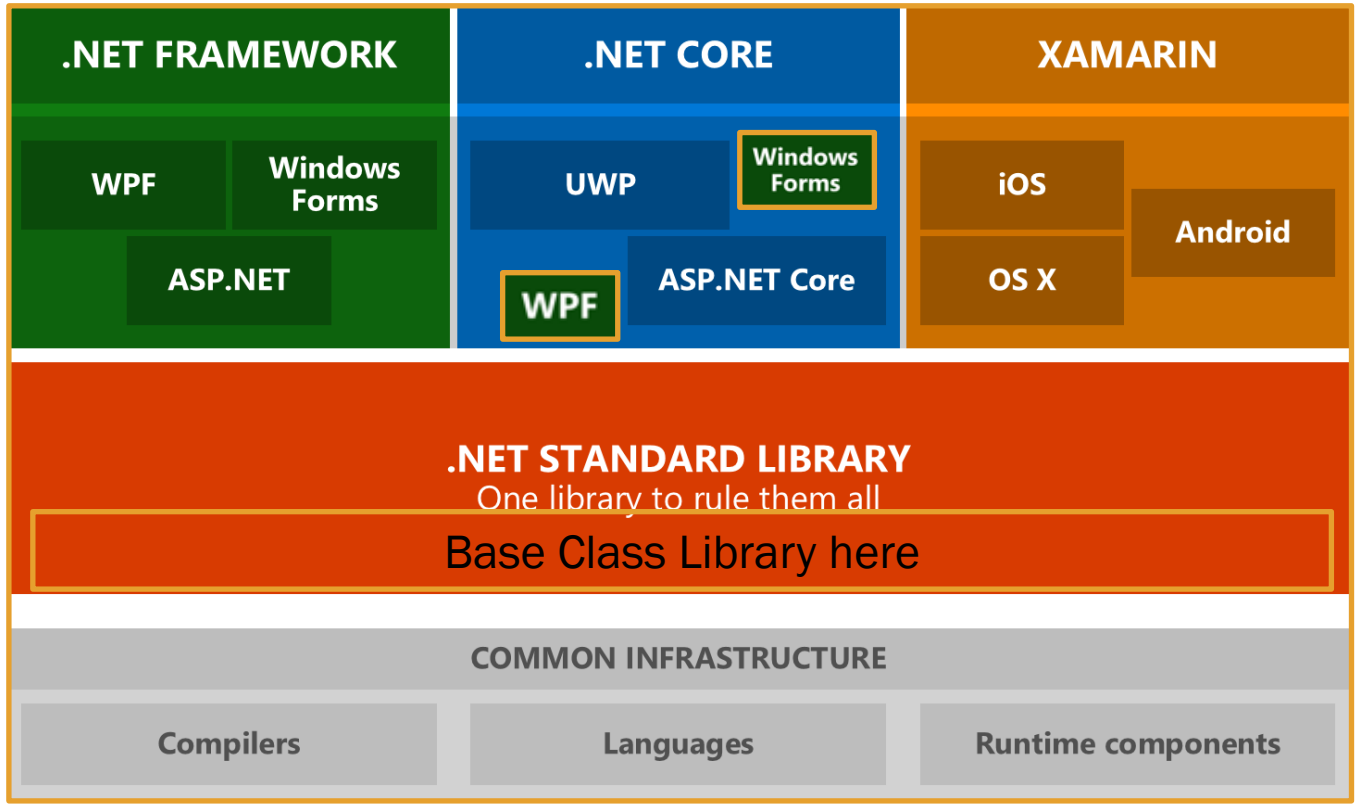
BCL provides the types that represent built-in ***CLI*** data types, basic file access, collections, custom attributes, formatting, security attributes, I/O streams, string manipulation, etc.



.NET Class Libraries

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

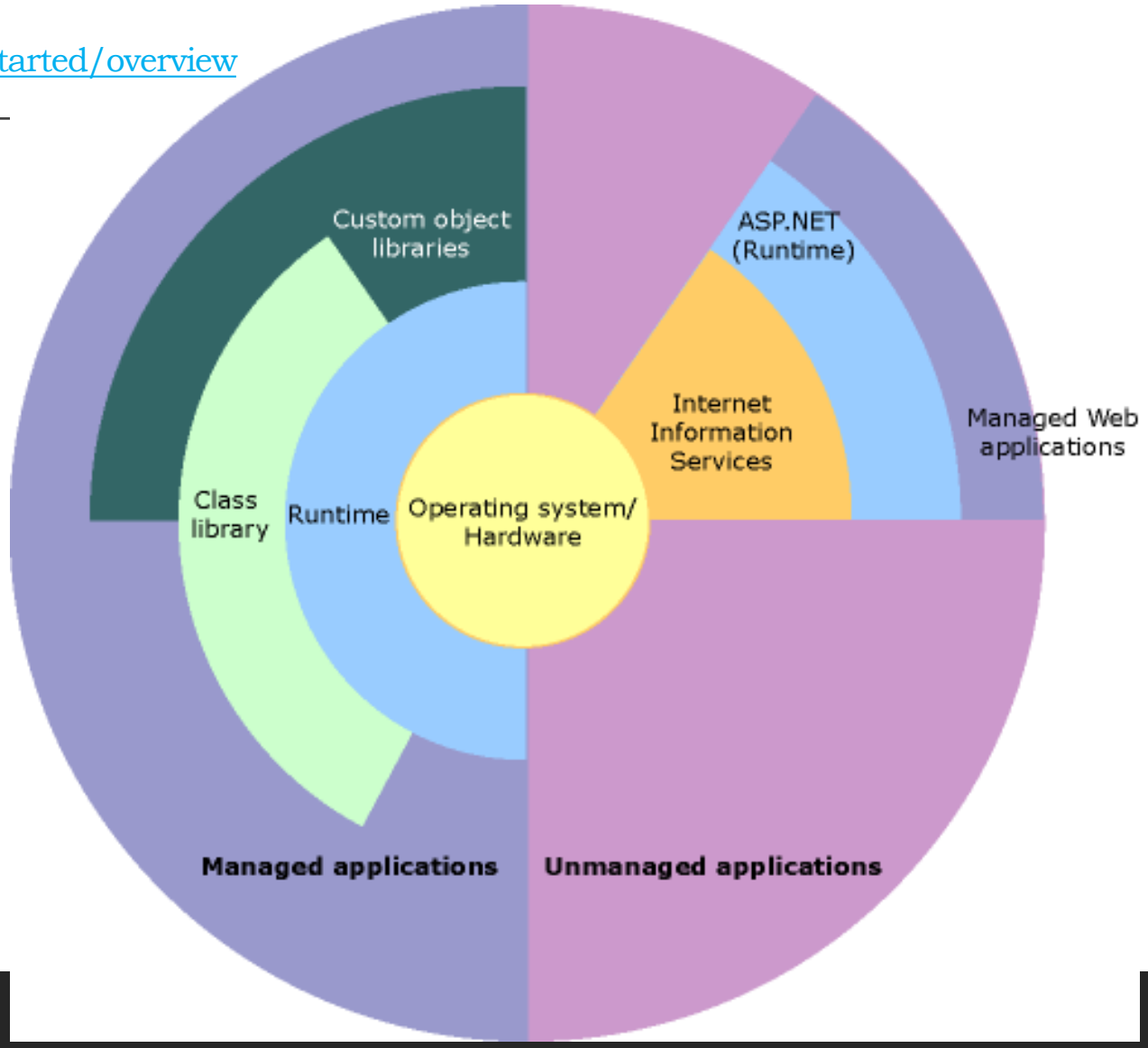
A ***class library*** is an object-oriented collection of reusable types that you can use to develop apps ranging from traditional command-line or graphical user interface (GUI) apps to apps based on the latest innovations provided by ASP.NET, such XML Web services.



.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.



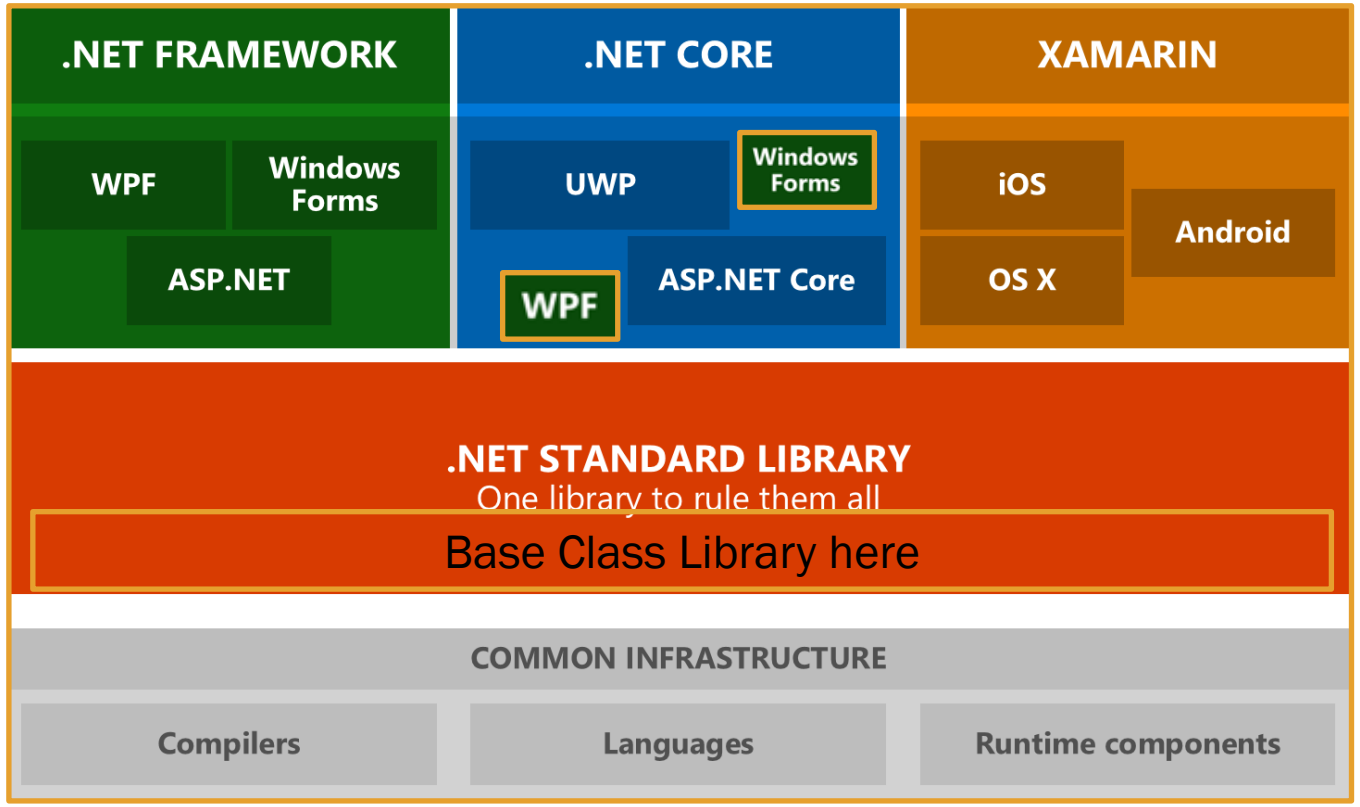
.NET CoreFX

https://docs.microsoft.com/en-us/dotnet/standard/glossary#corefx

Think of ***CoreFX*** as a fork of the .NET Framework ***BCL***.

CoreFX is the foundational class library for ***.NET Core***. It defines the types for primitives, collections, file systems, console, JSON, XML, async and many others.

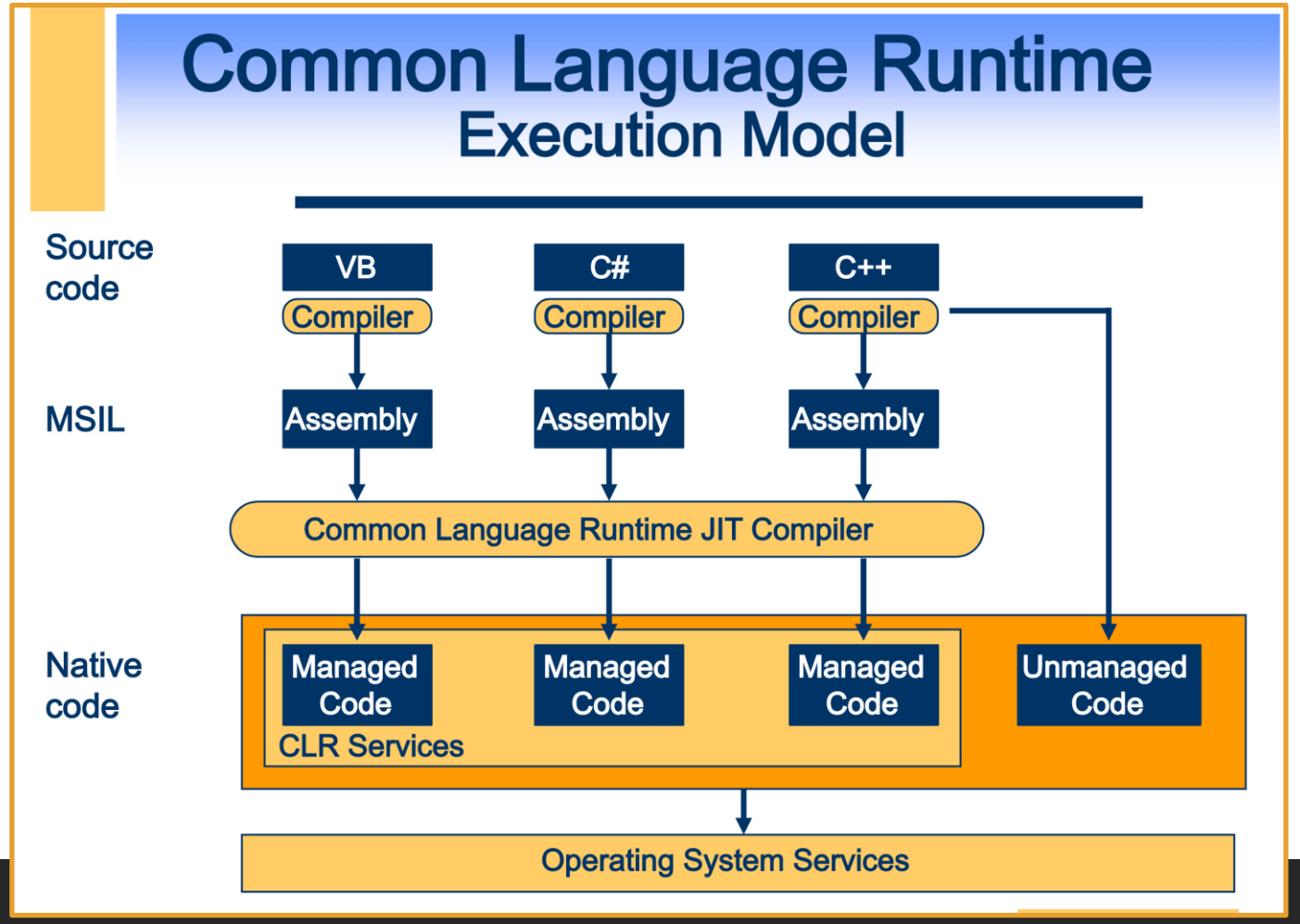
CoreFX makes up the ***.NET Core Base Class Library (BCL)***.



Managed Code

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

- 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

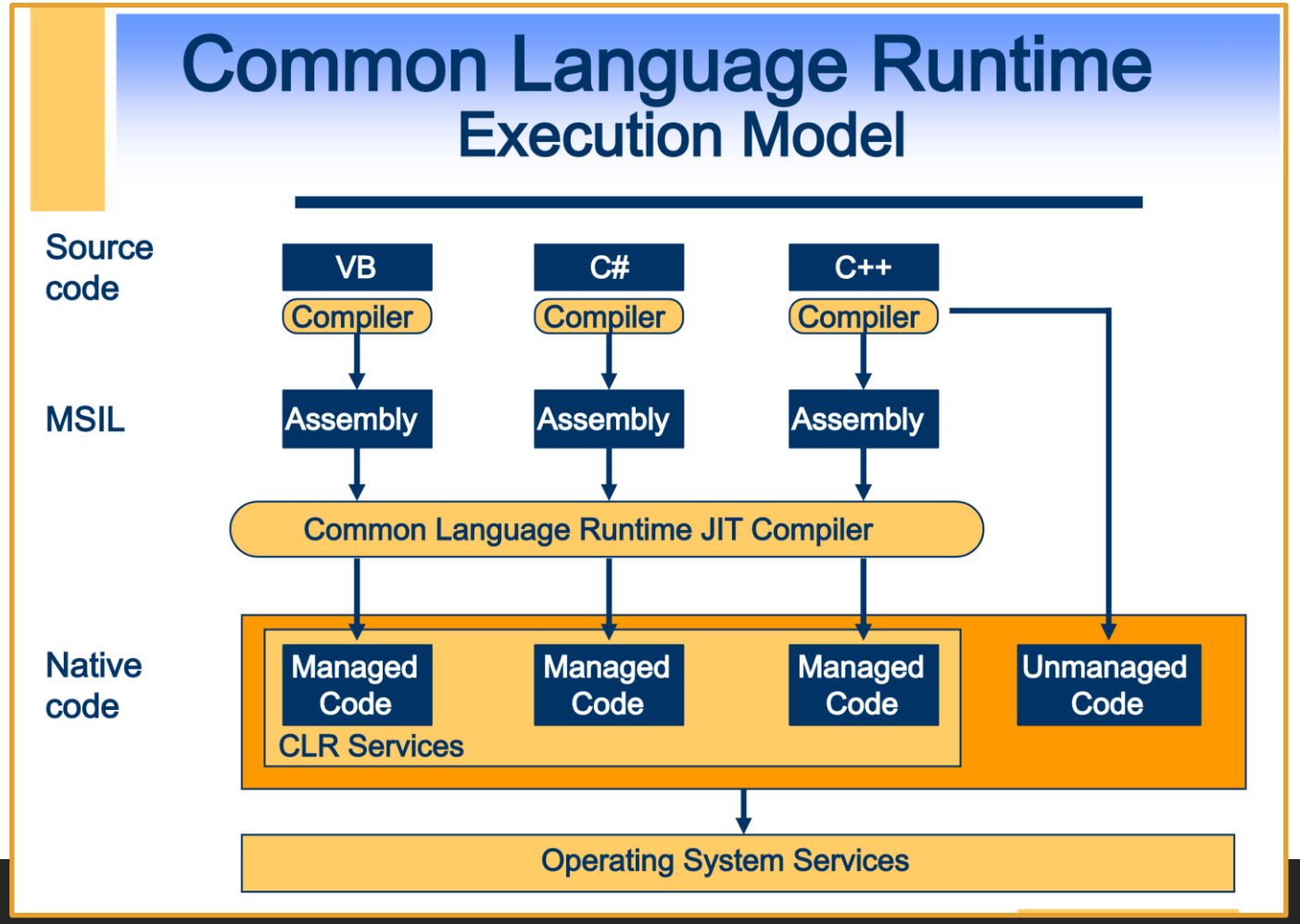
https://docs.microsoft.com/en-us/dotnet/framework/interop/

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=netframework-4.8

- 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

https://docs.microsoft.com/en-us/dotnet/api/system.idisposable?view=netframework-4.8

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

```
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 implements the intermediate language (IL) for a **try/finally** block.

Using Block and IDisposable

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

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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 the ***Dispose*** method 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/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 extra curly braces to create the 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;
}
```