



# CLI

(Common Language Infrastructure)

---

.NET

*The **Common Language Infrastructure (CLI)** is an open specification developed by Microsoft and standardized by ISO and ECMA that describes executable code and a runtime environment that allows multiple high-level languages to be used on different computer platforms without being rewritten for specific architectures.*

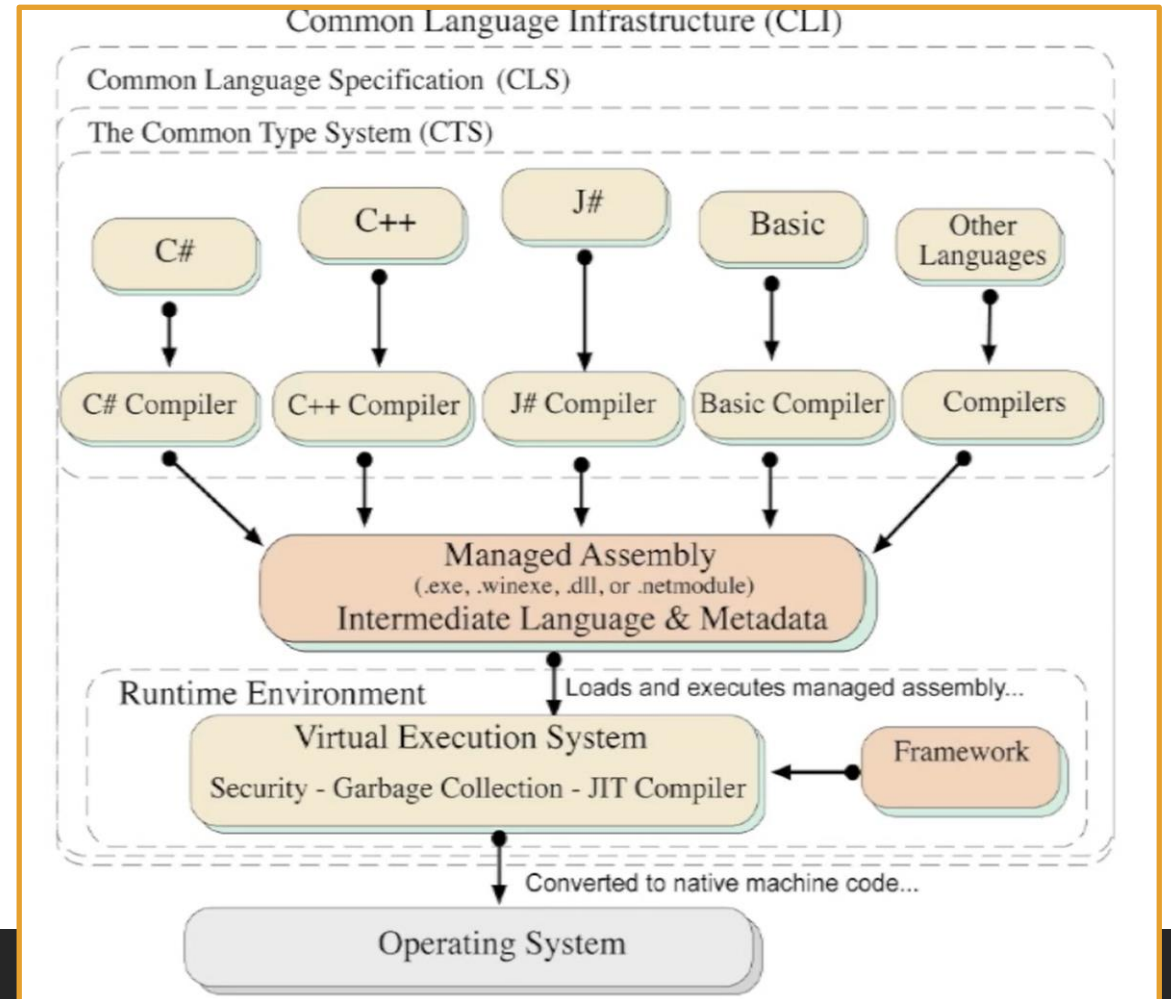
[HTTPS://EN.WIKIPEDIA.ORG/WIKI/COMMON\\_LANGUAGE\\_INFRASTRUCTURE](https://en.wikipedia.org/wiki/Common_Language_Infrastructure)

# CLI (Common Language Infrastructure)

<https://searchapparchitecture.techtarget.com/definition/Common-Language-Infrastructure-CLI>

Part of Microsoft's .NET strategy, **Common Language Infrastructure (CLI)** enables an application program written in any programming language to be run on any operating system using a “common” runtime program rather than a language-specific one.

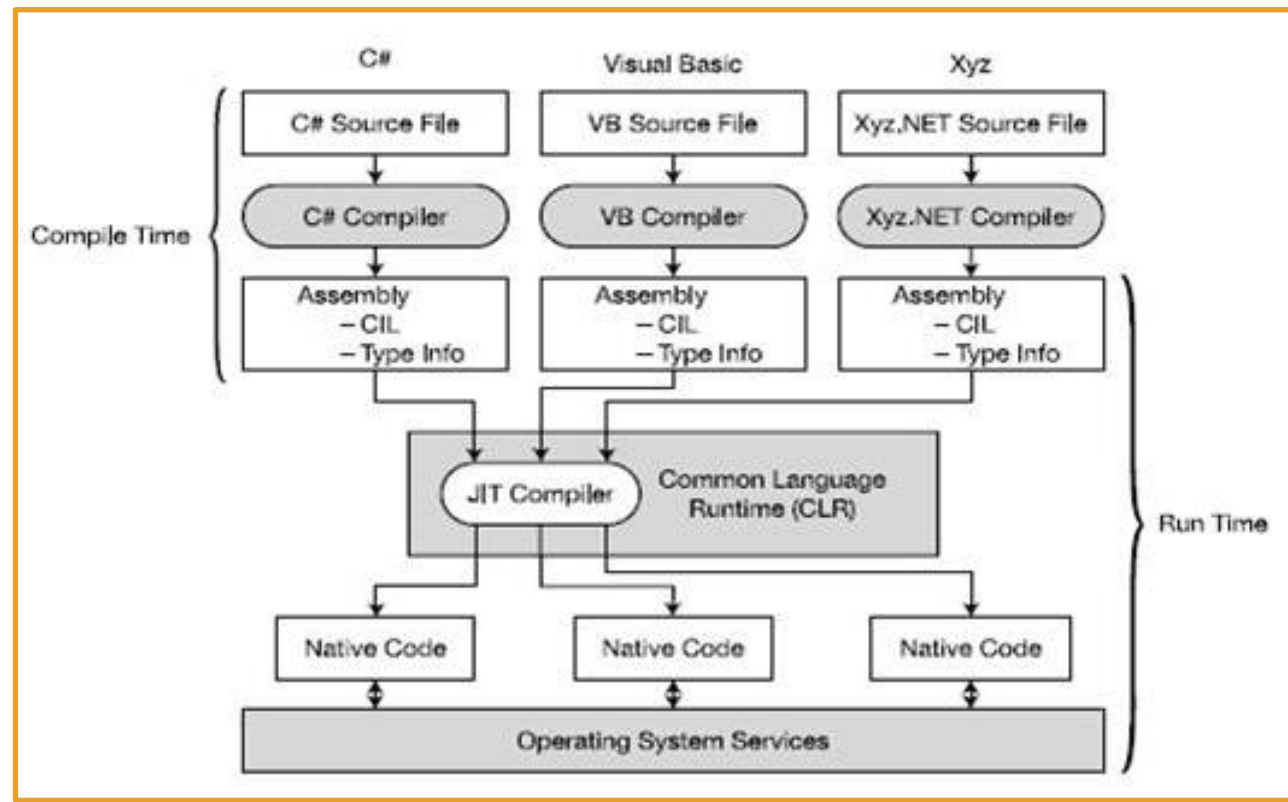
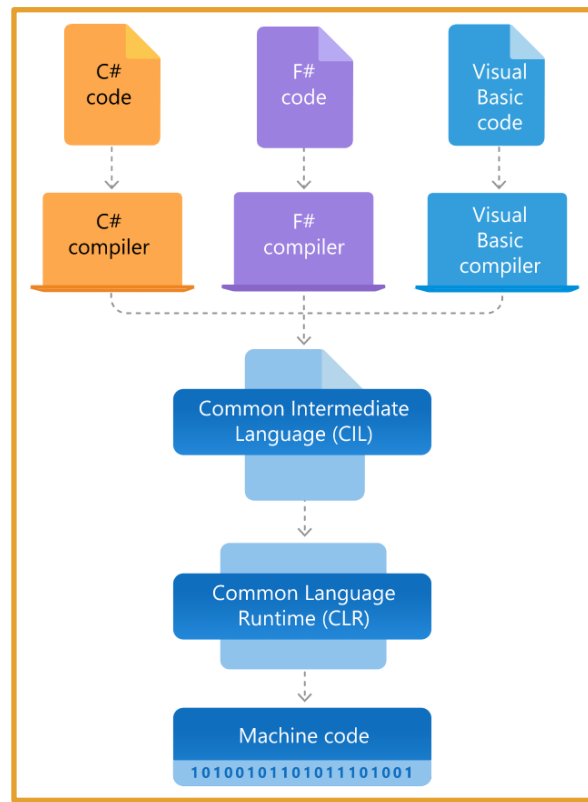
**Common Language Infrastructure** provides a virtual execution environment comparable to the one provided by Sun Microsystems for Java programs.



# CLI (Common Language Infrastructure)

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

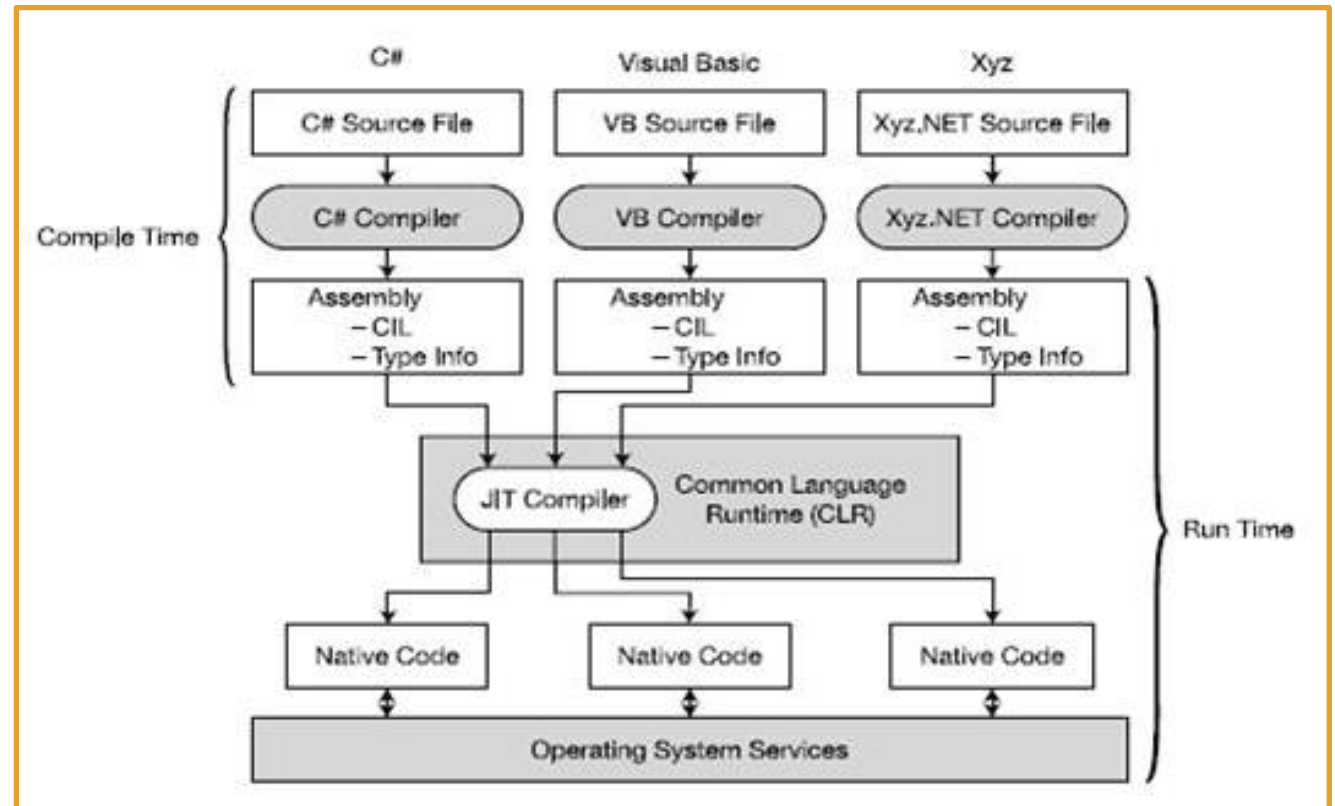
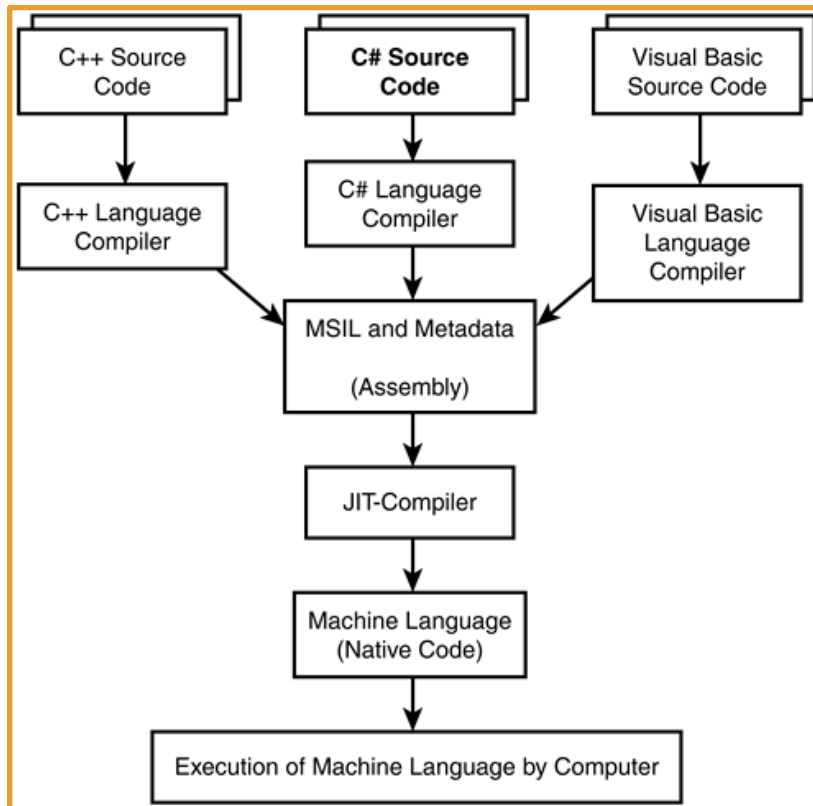
<https://dotnet.microsoft.com/learn/dotnet/what-is-dotnet-framework>





# CLI - Two views, one model

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



# CTS (Common Type System)

<https://docs.microsoft.com/en-us/dotnet/standard/common-type-system>

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

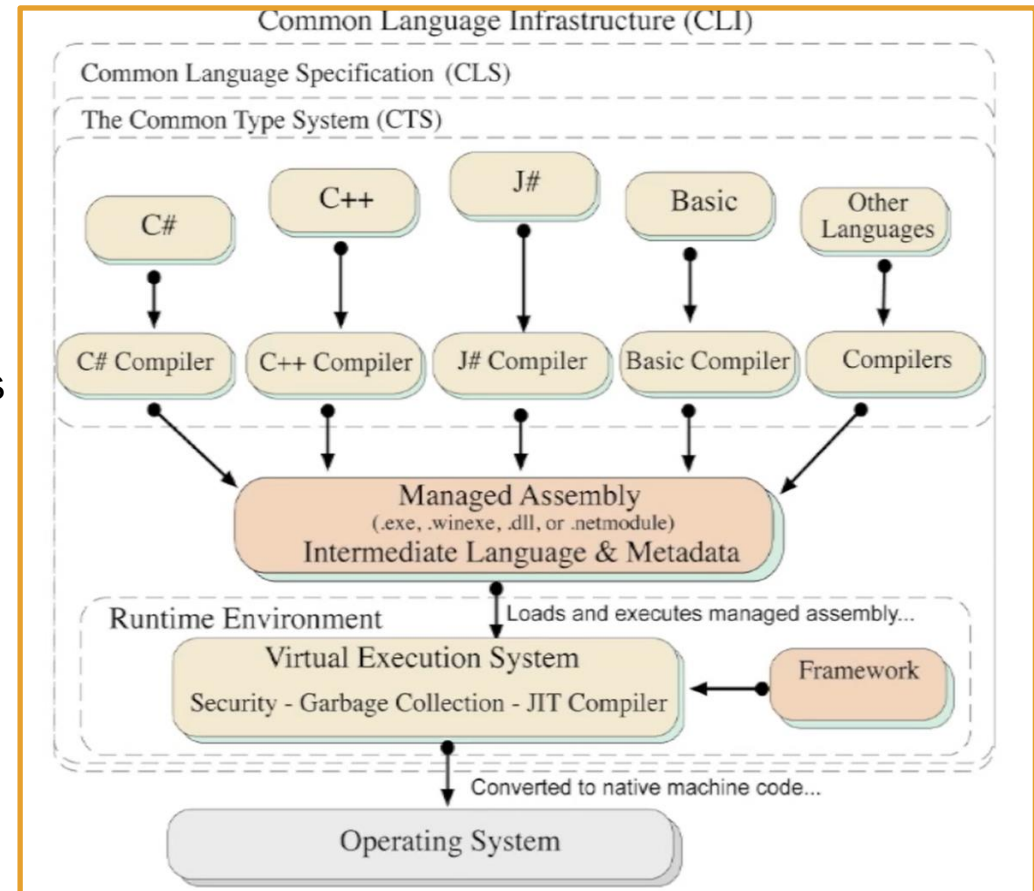
<https://www.youtube.com/watch?v=b7L03h7nMwg>

The **CTS** is used by the **CLR** to enforce strict typing and code verification.

To ensure that all compilers generate managed code that conforms to the **CTS**, the **CTS**:

1. describes all data types and all related constructs which are supported by the **CLR**
2. details how they must be represented in the .NET metadata format
3. specifies how entities can interact with each other

This means that **managed code** can consume other managed types and instances, while strictly enforcing type fidelity and type safety.



# CTS (Common Type System)

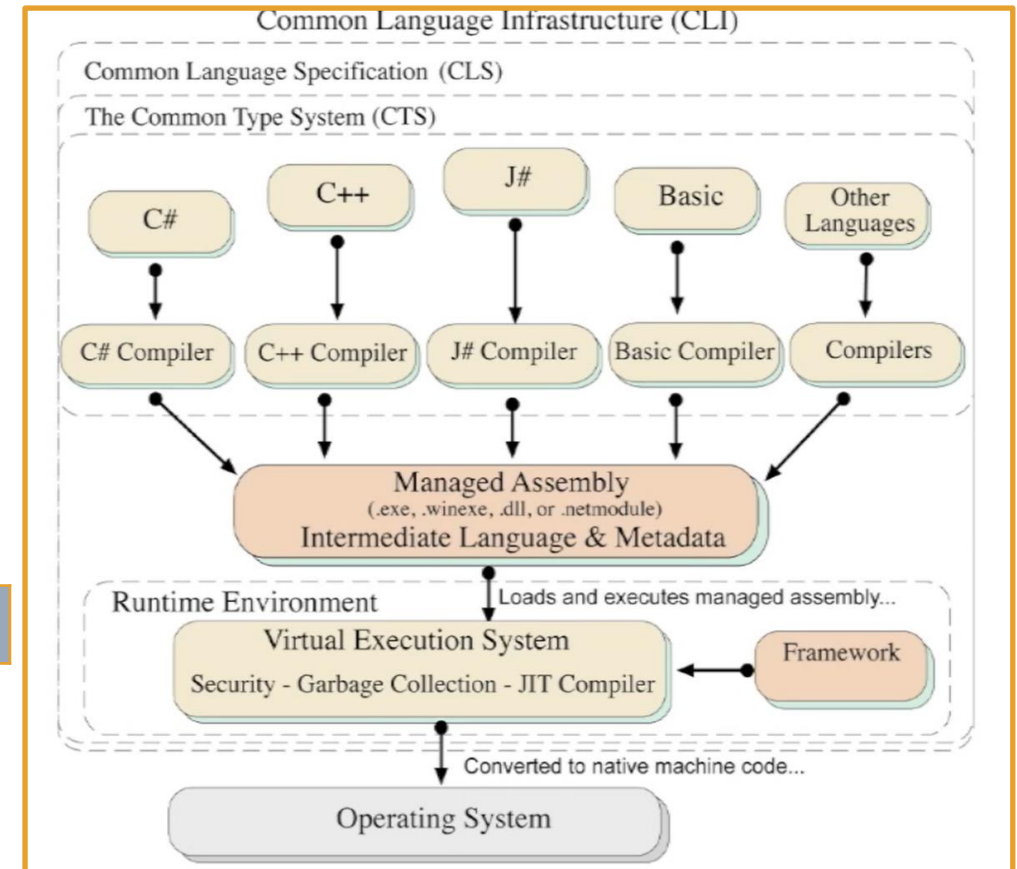
<https://docs.microsoft.com/en-us/dotnet/standard/common-type-system>  
<https://www.youtube.com/watch?v=b7L03h7nMwg>

The **CTS** provides a library of the basic primitive data **types** to be used in application development.

- **CTS** defines the two main **types** (reference and value types) that should be supported.
- **CTS** defines several categories of **types**, each with their specific semantics and usage:

Classes	Structs	Enums	Interfaces	Delegates
---------	---------	-------	------------	-----------

- **CTS** defines all other properties of the **types** (access modifiers, valid type members, how inheritance and overloading works, etc).



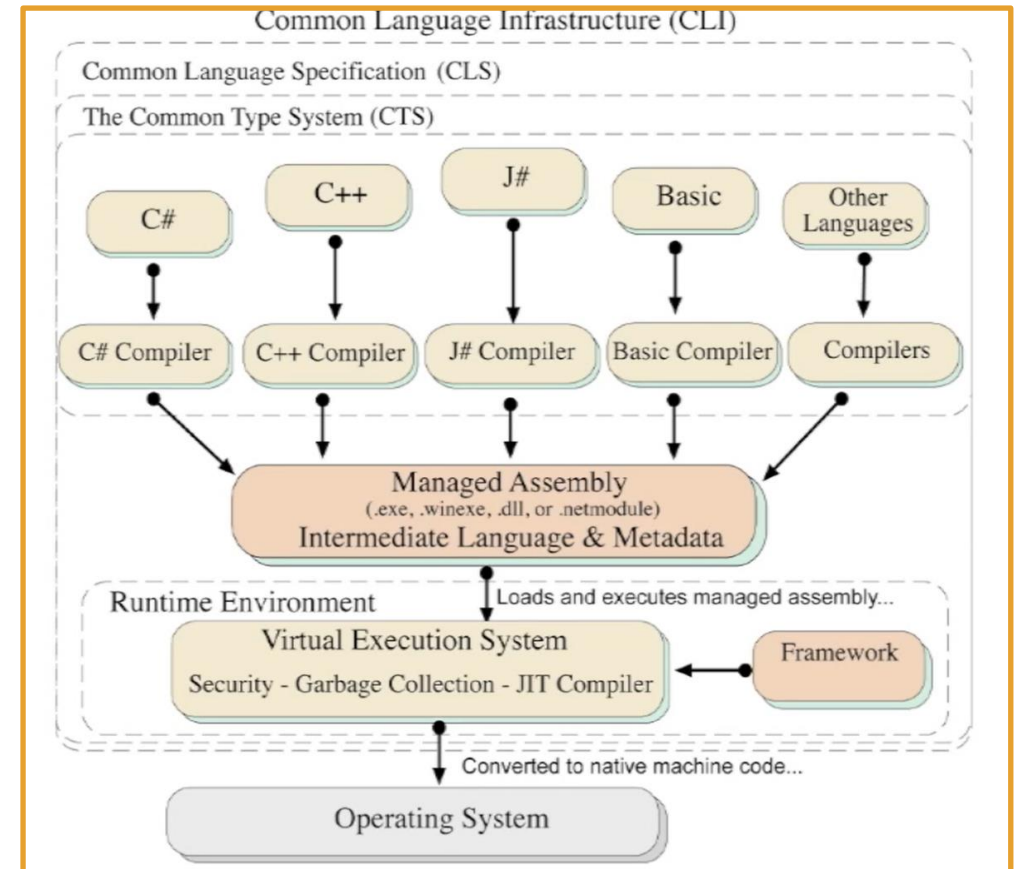
# CLS (Common Language Specification)

<https://docs.microsoft.com/en-us/dotnet/standard/common-type-system>

Since there are numerous different languages, .NET has specified the commonalities required to enable full interoperability between languages into something called the **Common Language Specification (CLS)**.

**CLS** is a subset of the **CTS**. This means that all rules of the **CTS** apply to the **CLS** also.

**CLS** defines a set of rules and restrictions that every language must follow which runs under the .NET framework. It provides a sort of recipe for any language that is implemented on top of .NET on what it must support.





# CIL (Common Intermediate Language)

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

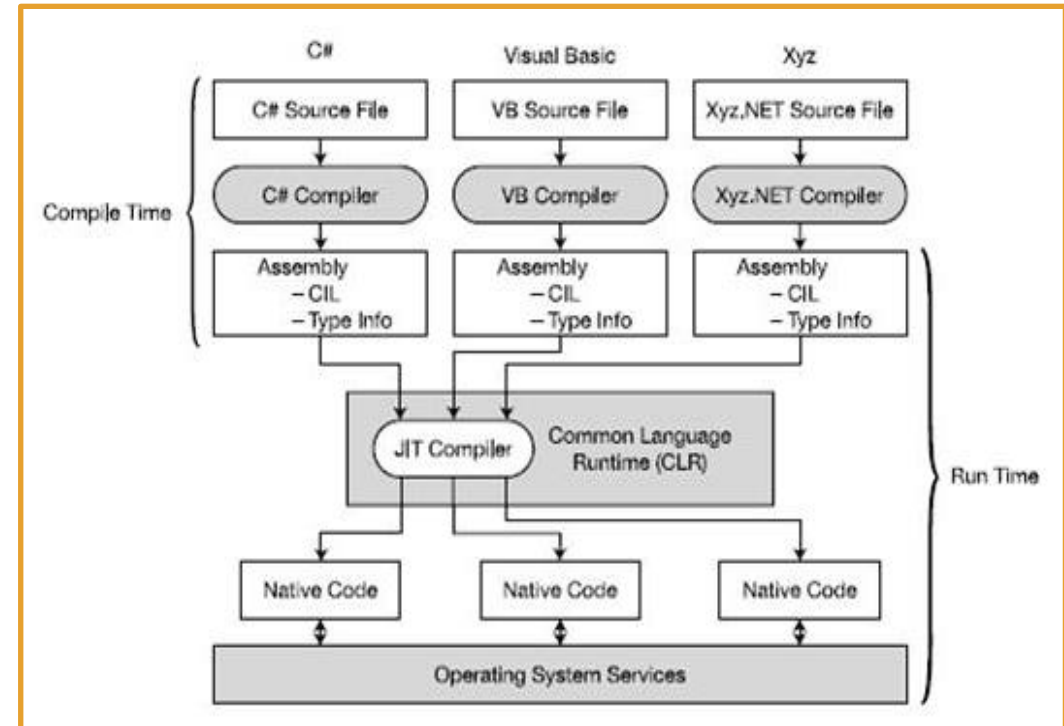
## *Common Intermediate Language (CIL)\**

is the intermediate language binary instruction set defined within the *Common Language Infrastructure (CLI)*.

*CIL* instructions are executed by the *Common Language Runtime*.

Languages which target the *CLI* compile to *CIL*.

Runtimes *Just-In-Time(JIT)* compile *CIL* instructions into native code.



\*CIL was formerly called *Microsoft Intermediate Language (MSIL)* or *Intermediate Language (IL)*.

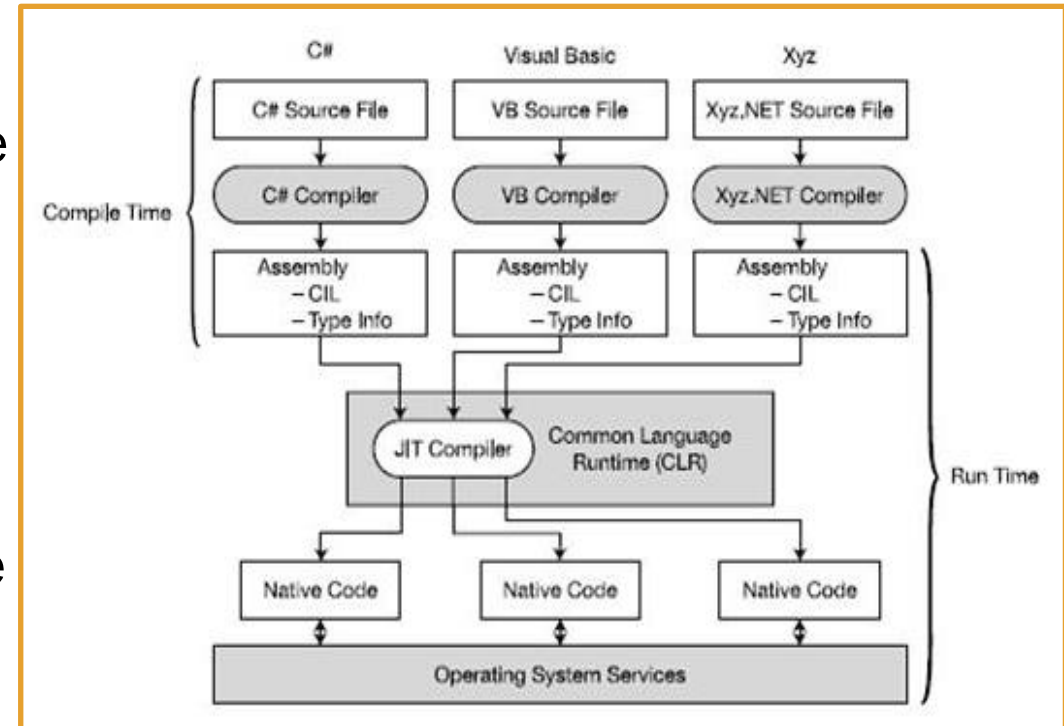
# JIT (Just In Time Compiler)

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

<https://docs.microsoft.com/en-us/dotnet/standard/managed-execution-process#compilation-by-the-jit-compiler>

**Just-In-Time (JIT) compilation** involves compilation of a program at run time.

**JIT** compilation assumes that some code might never be called during execution. Instead of using time and memory to convert all the **CIL** in a **PE (portable executable)** file to native code, it converts the **CIL** as needed during execution and stores the resulting native code in memory so that it is accessible for subsequent calls in the context of that process.



# VES (Virtual Execution System)

[https://en.wikipedia.org/wiki/Virtual\\_Execution\\_System](https://en.wikipedia.org/wiki/Virtual_Execution_System)

A **Virtual Execution System (VES)** is a run-time system of a **Common Language Infrastructure (CLI)** which provides an environment for executing managed code where the **Common Intermediate Language (CIL)** instruction set can be executed.

The **Common Language Runtime (CLR)** is the .NET Framework's implementation of a **VES**. It provides direct support for a set of built-in data types. It defines:

- a hypothetical machine with an associated machine model and state,
- a set of control flow constructs, and
- an exception handling model.

