

# **Introduction to .net Framework**

Introduction to .NET FRAMEWORK



# What will we learn?

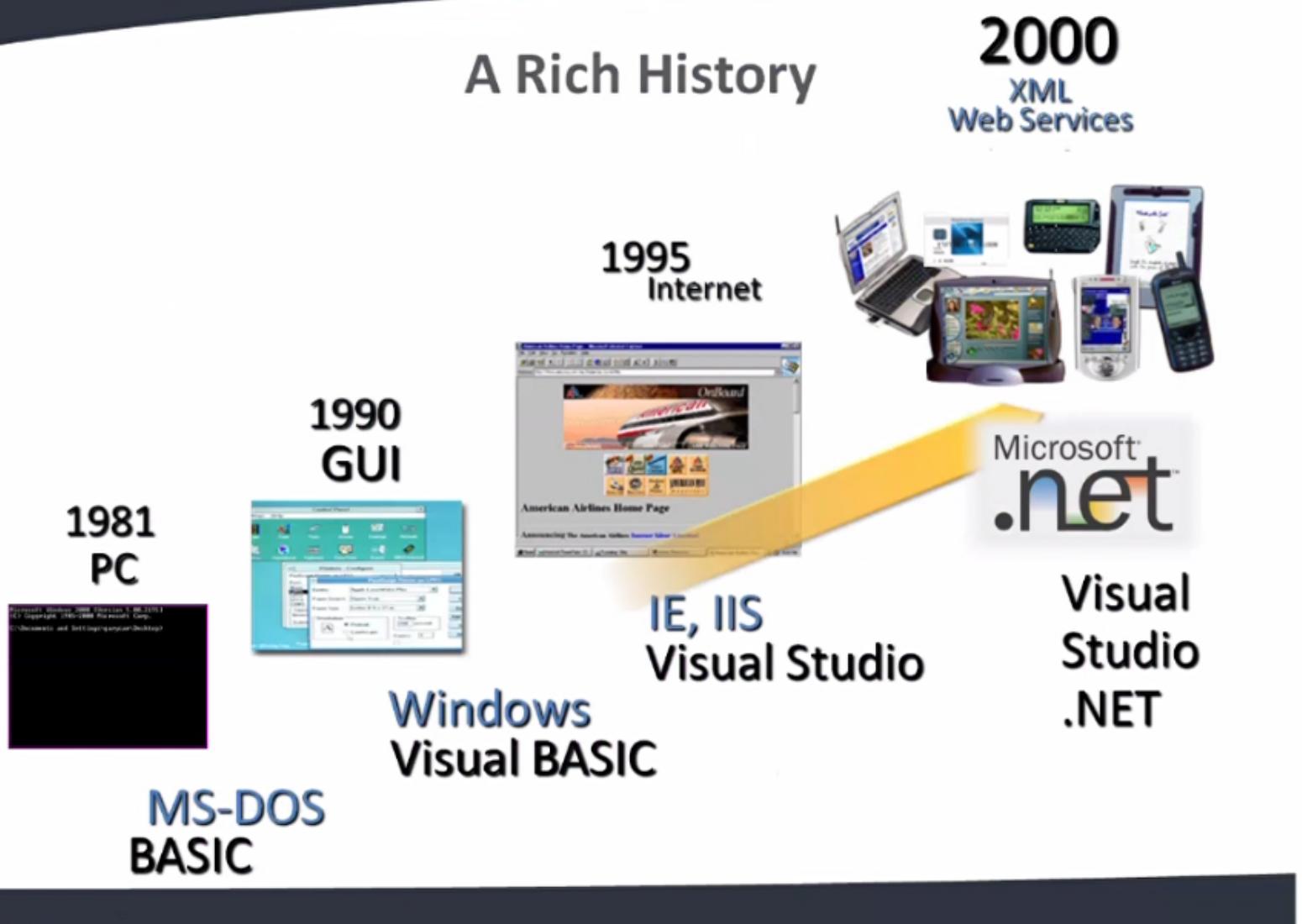
.NET FRAMEWORK

By end of this topics we will understand

- History of .NET
- Why & what of .NET
- .NET Framework
- .NET Framework Components
- CLR
- BCL
- .NET Framework Libraries
- .NET Languages
- .NET Assemblies
- PE
- Visual Studio .NET
- ADO.NET
- ASP.NET
- WebService
- The .NET Framework Stack
- .NET CORE
- Characteristics of .NET Core
- The .NET Core Platform

.NET FRAMEWORK

## A Rich History



**SMPS** :-Switch Mode Power Supply  
it converts AC to DC

## **Assignment**

1. **Understand What is Processor**
2. **What is mega hertz and giga hertz**
3. **What is a clock speed**
4. **What is Multi threading in Processing (Multi threading in core processors)**
5. **what is core processors how exactly it works**
6. **just watch Google -IO (2018/2019/2020/2021)**

**watch this series if you have time then watch 2015/2016/2017**

you will really gone mad by this you can see how the world is changing you can see

there is massive difference between the technology (jitni progress humne ki thi 2000-2010 me utti humne 2010 se 2015 me karli and the amount of work we have did in 2015-2020 it was beautiful)

here you just need a small idea and implementation and you can make a huge money

mumbai me dabba wala ki story suno 7th class ke ladke ne ek problem face ki uska sol diya and make 100crore company

7. **What is a USP**
8. **What is bluetooth and how it works ,what are the different version of it we have**
9. **Understand about sensors(like in tesla self driven car they have soo many sensors) and this is something AI is a market**

# **I have a Dream for your final project I want to integrate AI in your final project**

**my search bar should have a voice recognition  
so NLP is something which i gone to include in our final project  
this is fun if do this and present to your manager they stand up  
and clap for you (its a hard journey so push your self )**

## **10. What is a NLP and How it Works**

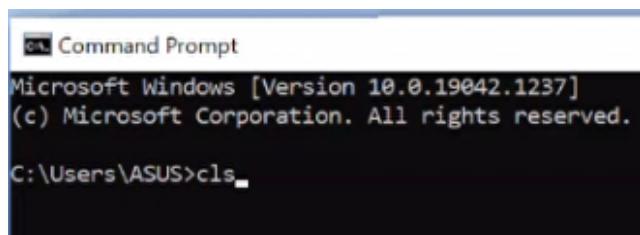
So ,we have pc it has SMPS in it ,the power will be send to SMPS as soon as we switch on and internally it will run the **POST -(Power on self test) command**  
Who will run the post command -----your **ROM**

<sup>11.</sup> **What is the Difference between RAM and ROM**

We have different type of ROM the most important thing what it does is booting (process where os gets loaded to the memory (to the ram)) and before that it runs the post it is the process which will boot your os

## SOME IMPORTANT COMMAND PROMPT COMMANDS

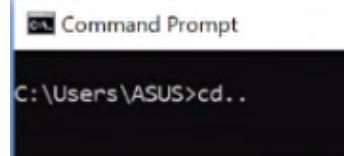
- 1. cls** -----to clear the screen



A screenshot of a Windows Command Prompt window. The title bar says "Command Prompt". The window shows the following text:  
Microsoft Windows [Version 10.0.19042.1237]  
(c) Microsoft Corporation. All rights reserved.  
C:\Users\ASUS>cls.

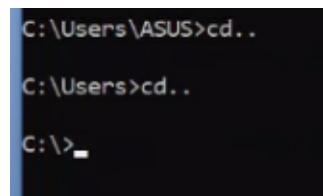
- 2. cd..**-----it will take you one directory outside

in DOS we call it directory in windows we call it Folder .



A screenshot of a Windows Command Prompt window titled "Command Prompt". The window shows the command "C:\Users\ASUS>cd.." being entered. The background of the window is black, and the text is white.

```
C:\Users\ASUS>cd..
```



A screenshot of a Windows Command Prompt window titled "Command Prompt". The window shows the command "C:\Users\ASUS>cd.." being entered. Below it, another "cd.." command is shown, followed by a prompt "C:\>". The background of the window is black, and the text is white.

```
C:\Users\ASUS>cd..  
C:\Users\ASUS>cd..  
C:\>
```

3. **dir**-----it will show me all the files and folder available in this folder <Dir> it means it is directory

```
C:\>dir
Volume in drive C is OS
Volume Serial Number is 1456-6BCD

Directory of C:\

23-09-2021  15:51    <DIR>        data
02-07-2019  16:51    <DIR>        eSupport
14-06-2021  00:09    <DIR>        inetpub
11-10-2021  18:20    <DIR>        Intel
08-05-2021  17:28    <DIR>        JUnit
07-12-2019  14:44    <DIR>        PerfLogs
26-04-2019  14:03    <DIR>        Preload64
23-09-2021  14:55    <DIR>        Program Files
22-09-2021  18:11    <DIR>        Program Files (x86)
05-07-2021  23:29    <DIR>        Shashi
27-09-2021  11:53    <DIR>        Softwares
13-06-2021  23:38    <DIR>        temp
26-04-2021  22:53    <DIR>        Users
10-05-2021  12:37    <DIR>        Website
26-04-2019  14:03    <DIR>        WIMAPPLY
27-09-2021  19:13    <DIR>        Windows
               0 File(s)          0 bytes
               16 Dir(s)  118,332,919,808 bytes free
```

- 4.
5. **cd folder name**-----to enter in some file

```
C:\>dir
Volume in drive C is OS
Volume Serial Number is 1456-6BCD

Directory of C:\

23-09-2021 15:51    <DIR>        data
02-07-2019 16:51    <DIR>        eSupport
14-06-2021 00:09    <DIR>        inetpub
11-10-2021 18:20    <DIR>        Intel
08-05-2021 17:28    <DIR>        JUnit
07-12-2019 14:44    <DIR>        PerfLogs
26-04-2019 14:03    <DIR>        Preload64
23-09-2021 14:55    <DIR>        Program Files
22-09-2021 18:11    <DIR>        Program Files (x86)
05-07-2021 23:29    <DIR>        Shashi
27-09-2021 11:53    <DIR>        Softwares
13-06-2021 23:38    <DIR>        temp ← see i have a temp
26-04-2021 22:53    <DIR>        Users
10-05-2021 12:37    <DIR>        Website
26-04-2019 14:03    <DIR>        WIMAPPLY
27-09-2021 19:13    <DIR>        Windows
          0 File(s)          0 bytes
         16 Dir(s)  118,332,919,808 bytes free
```

```
C:\>cd temp
C:\temp>
```

see we have entered inside temp folder

5. **mkdir directory name you want to give**-----use to  
create new directory

```
C:\temp>mkdir temp  
C:\temp>
```

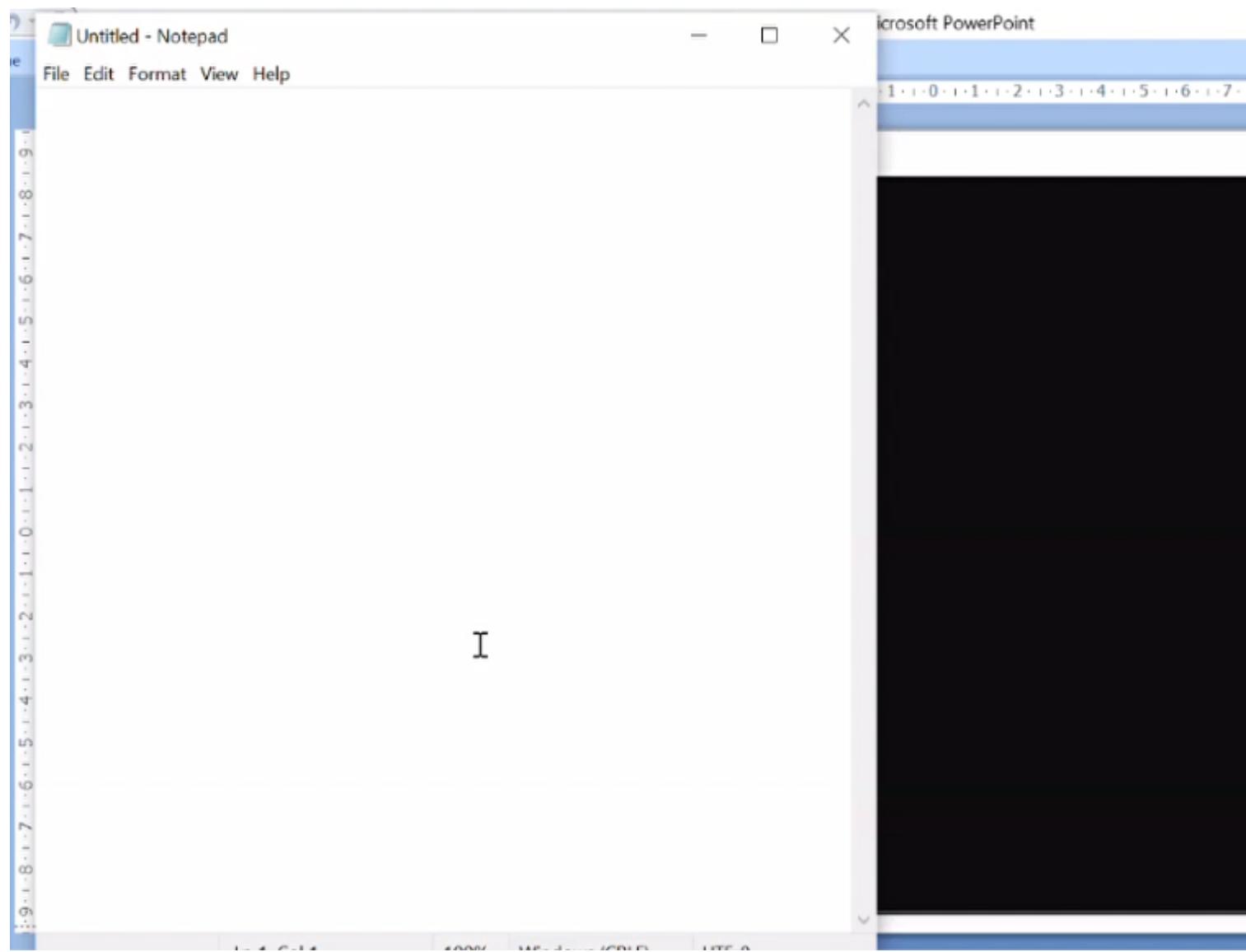
i have created a directory named temp

```
C:\temp>mkdir temp  
C:\temp>cd temp  
C:\temp\temp>_
```

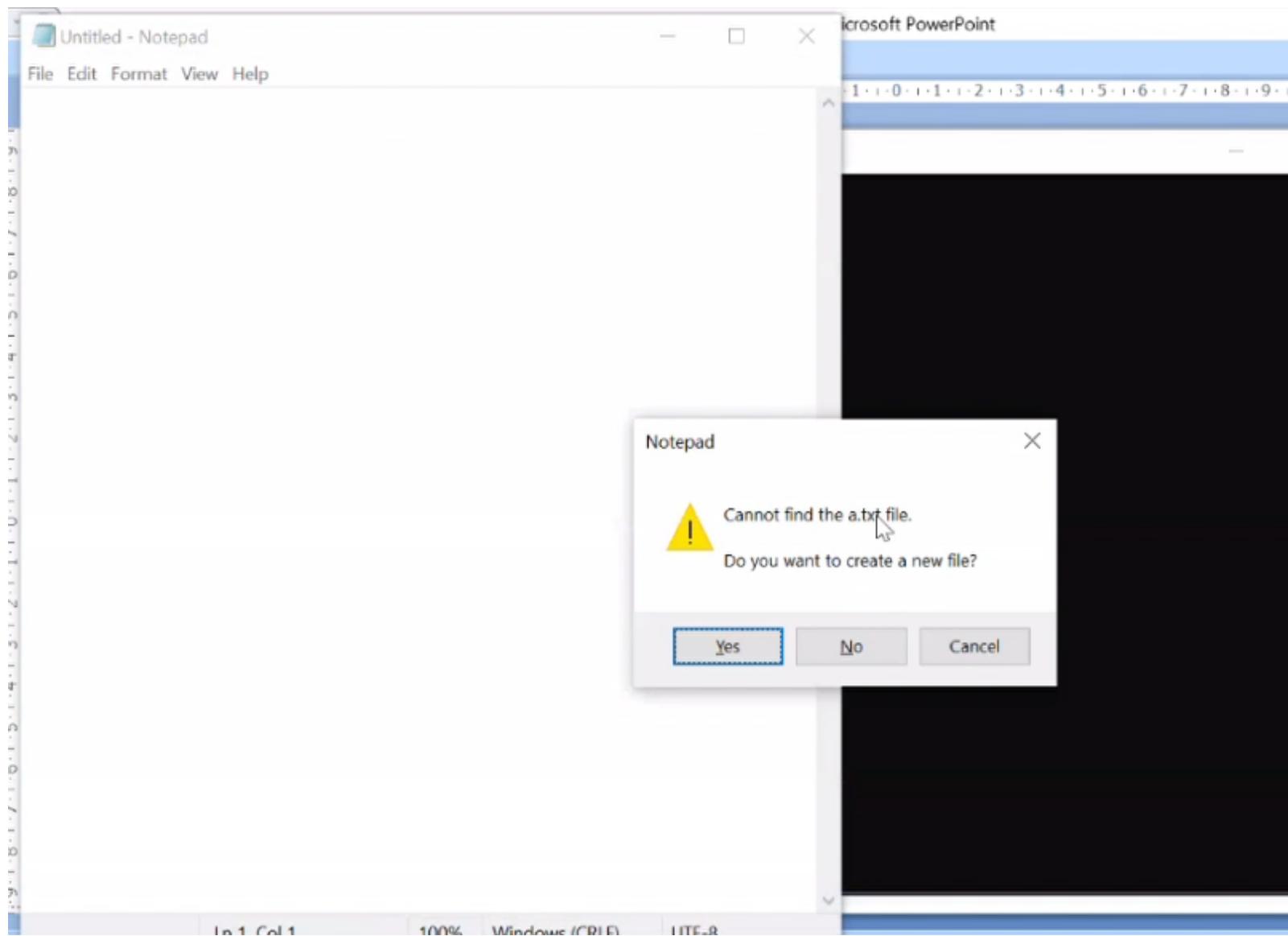
to enter in this directory write ctory write cd temp

```
C:\temp\temp>notepad_
```

when i write notepad and press enter it opens notepad for me



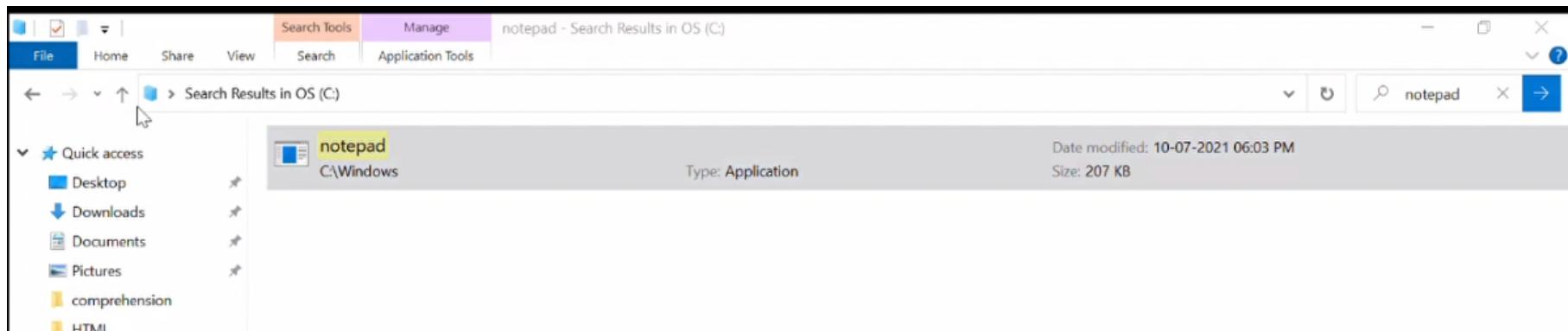
When i specify a particular file name here like **notepad a.txt**



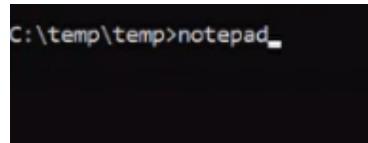
it will gone ask weather you want to save it i'll say yes  
so a txt file will be created and opened in notepad as a.txt

**What is this notepad here-----it is the name of application  
called notepad.exe  
which is present somewhere in the programs folder**

**Short cut to open file explorer is ----- (winkey+E)**



See my notepad is in C:\Windows



and i am in side the temp folder but still i am able to access the notepad from here

### **how it is possible?**

because notepad is a file na its a application its a .exe file  
and application is something which we can directly open and  
notepad is a type of assembly (it a exe executable assembly)  
to bhi yaha se kese open kar liya us folder me jaa ke karna tha na

**SO when ever you type any command here ,what my windows os does is it will gone to check weather the executable file is present in the path**

(path is a variable where it is in window)

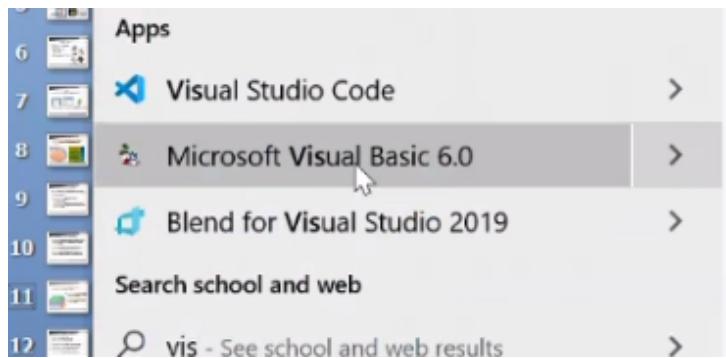
```
C:\>path  
PATH=C:\Program Files (x86)\Common Files\Oracle\Java\javapath;C:\Softwares\WINDOWS.X64_Oracle\bin;C:\Program Files\Comm  
on Files\Oracle\Java\javapath;C:\WINDOWS\system32;C:\WINDOWS;C:\WINDOWS\System32\Wbem;C:\WINDOWS\System32\WindowsPowerShe  
ll\v1.0\;C:\WINDOWS\System32\OpenSSH\;C:\Program Files\Microsoft SQL Server\130\Tools\Binn\;C:\Program Files\Microsoft S  
QL Server\Client SDK\ODBC\170\Tools\Binn\;C:\Program Files\nodejs\;C:\Program Files\Microsoft SQL Server\120\DT  
S\Binn\;C:\Program Files\Microsoft SQL Server\Client SDK\ODBC\110\Tools\Binn\;C:\Program Files (x86)\Microsoft SQL Server\120\Too  
ls\Binn\;C:\Program Files\Microsoft SQL Server\120\Tools\Binn\;C:\Program Files (x86)\Microsoft SQL Server\120\Tools\Bin  
n\ManagementStudio\;C:\Program Files (x86)\Microsoft SQL Server\120\DT  
S\Binn\;C:\Program Files\dotnet\;C:\Program Files\Java\jdk1.8.0_281\bin;C:\Softwares\apache-maven-3.8.1-bin\apache-maven-3.8.1\bin;C:\Program  
Files\MySQL\MySQL Shell 8.0\bin\;C:\Users\ASUS\AppData\Local\Microsoft\WindowsApps;C:\Users\ASUS\AppData\Roaming\npm;C:\Users\ASUS\.dotnet\tools;C:\  
Program Files\Java\jdk1.8.0_281\bin;C:\Users\ASUS\AppData\Local\Programs\Microsoft VS Code\bin  
C:\>
```

it is in a environmental variable just like you have variable a,b,c,d .....  
in any program in windows also it has a variable called Environment variable

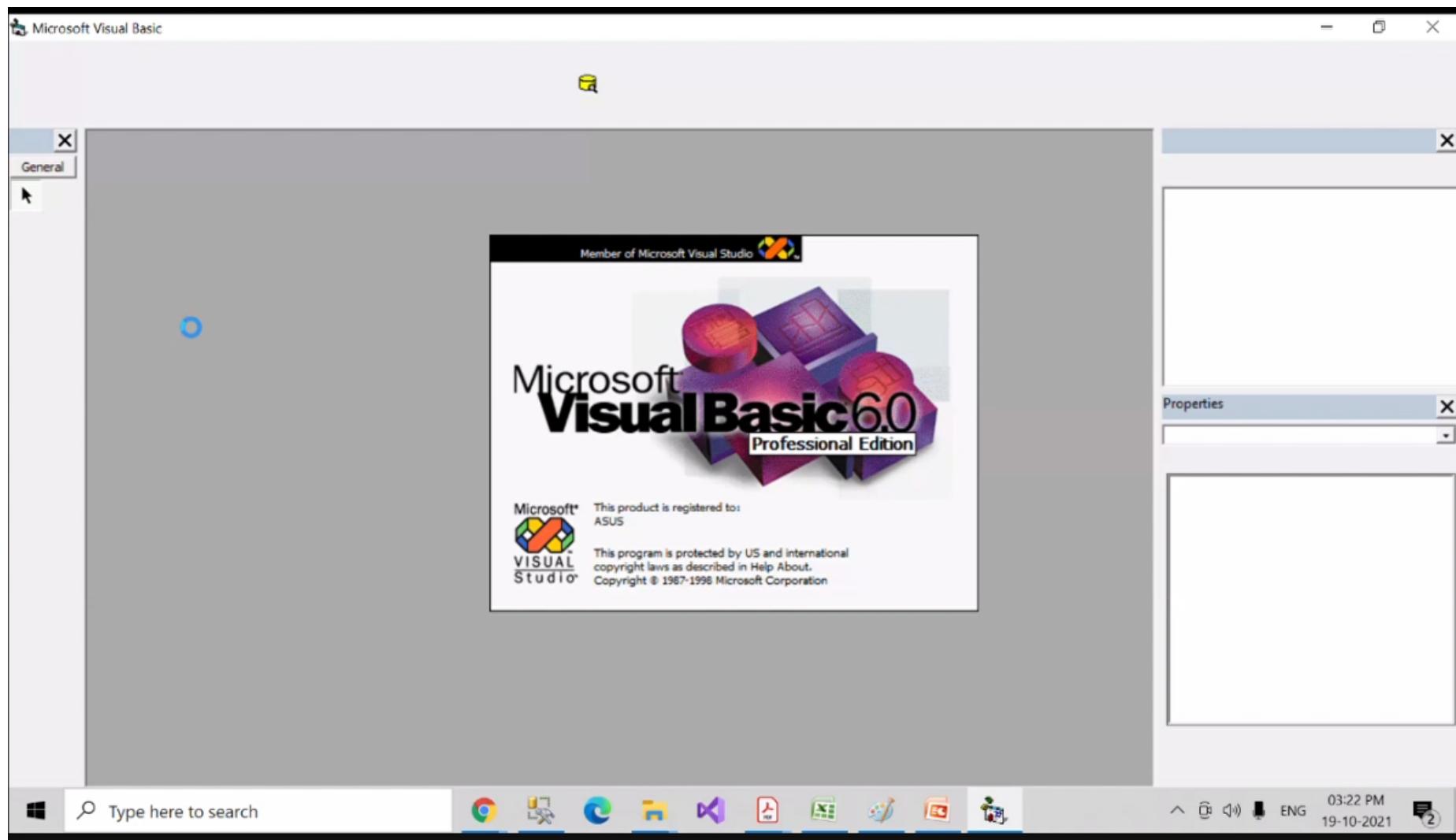
to agar path me save hai to kahi se bhi excute kar sakte hai  
otherwise location daalna hi padega bhale hi exe ho

## **Basic = Beginner's all purpose symbolic instruction code**

VB is very Easy language ,so you can see i have installed visual basic 6.0



And this is a beautiful product from microsoft which was introduced around year 2000 so it was something which most of the company uses to develop a Desktop application



What is Desktop application?

1. When ever you create a Desktop application ,This needs to be installed in your system

for ex. I don't have a notepad installed in my system i cannot work on it .

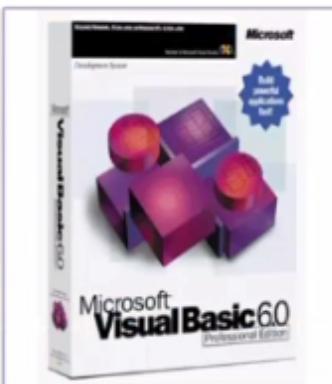
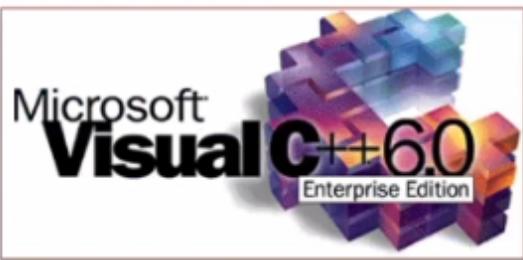
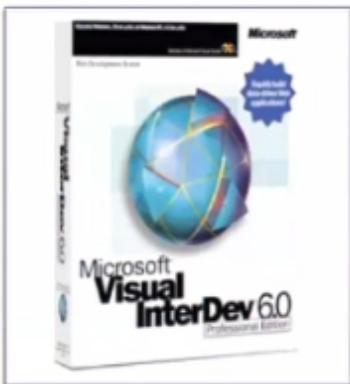
2. Desktop application depends completely on system it should be installed on the system where you want to use it
3. They utilize the hardware and software what ever you have on your pc
4. It is faster than Web Application because in web application you need internet and seed of your application depend on the bandwidth what what you have and we use server instance to store our data

## Before .NET

- **C/Win 32 API**
  - Unsafe (C) and complex (Win32)
- **C++ and MFC**
  - Better but still difficult
- **Visual Basic 6.0**
  - Nice, but not completely Object Oriented
- **COM**
  - Binary Compatibility, good model, still complex
  - Versioning problems
- **Java/J2EE**
  - Great, but not from Microsoft
  - GUI integration not optimal

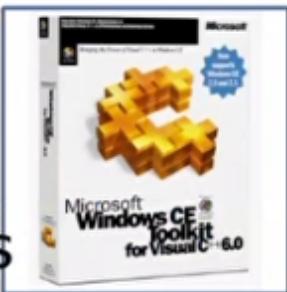
.NET FRAMEWORK

## Why .NET?



- Low Level
- Advance UI

Web



RAD



Devices

Advance  
Graphics

## Why .NET?

- Distinct Programming Models
- Learning Curve
  - Rich Client
  - Thin Client
- Different Job Different Language



before .net to create different application we need different technology and different platform

so microsoft came with the single platform which support all type of application development  
web ,desktop, mobile .....

The diagram illustrates the .NET Framework's support for various application types. At the top, a dark blue bar contains the text ".NET FRAMEWORK". Below it, a white bar contains the text ".NET". To the left, a screenshot of a web browser window titled "SimpleLaptop.net" shows a login page. In the center, a screenshot of a Windows application window titled "ExampleTool.exe" displays a form with fields for CustomerId, Name, StreetAddress1, StreetAddress2, City, State, Zip, Status, and LastOrderDate. To the right, there is a photograph of a silver mobile phone.

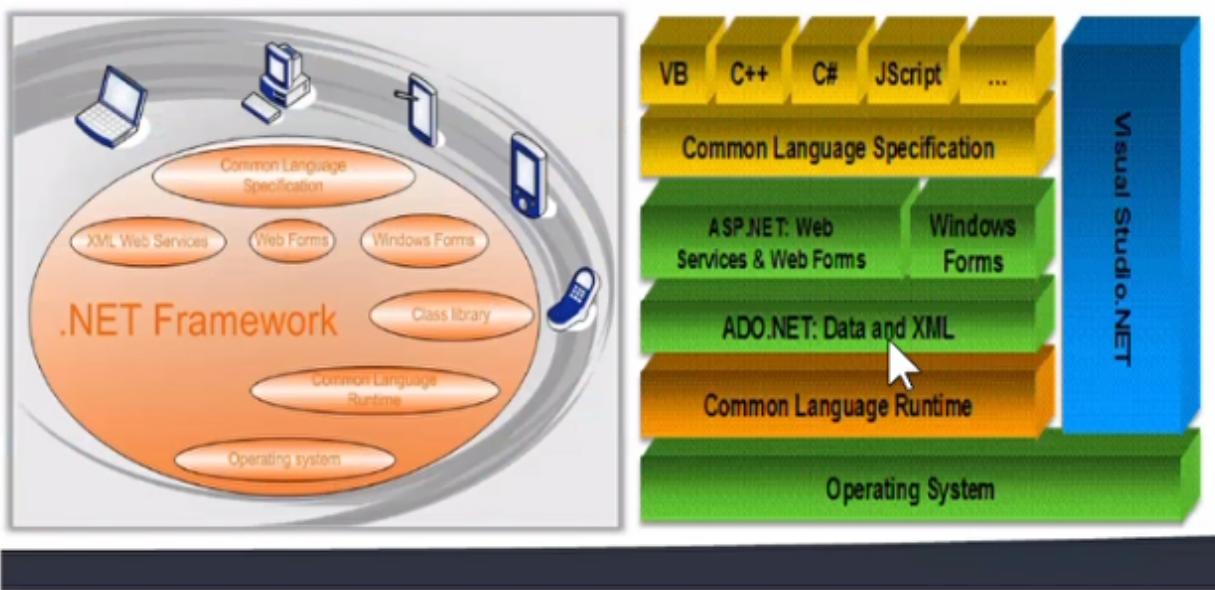
- Consistent Programming Model (BCL)

Web App's      Desktop App's      Mobile App's

so .net target all type of devices, users and developers

## .NET FRAMEWORK What is .NET ?

- .NET is a set of Microsoft software technologies
  - for connecting information, people, systems, and devices.



## What is a Framework?

- A Framework is a “defined support structure” in which another software project can be organized and developed.
- Typically, a framework may include
  - support programs,
  - code libraries
  - and a language amongst other software to help develop and glue together the different components of your project.

.net Framework is a complete support structure  
framework will have

1. particular language support ,

2. class Library
3. some sort of component and software already created for you

So, i already have support structure with me ,i just have to use this support structure and components and i can build my own application

.net focus mostly on the Rapid application Development (if you wan't to quickly develop an application, so you already have lot of things which is already there in the .net )

**if you want to do **CRUD** Operation so .net was the solution**

**C -----Create**

**R -----Read**

**U -----Update**

**D -----Delete**

i wan't to build an application where i can create some data (i can create some manager or student or whatever ) i want to create that structure

i want to read that structure

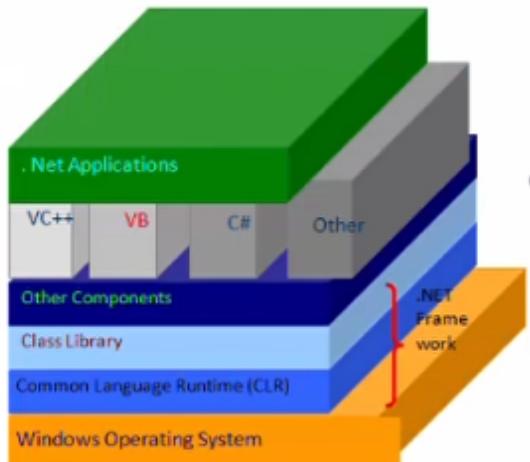
i want to update that structure

and then delete it

## What is .NET ?

- .NET is a set of Microsoft software technologies for connecting information, people, systems, and devices.

- .NET Framework is a common layer between .NET applications and Windows OS.
- .NET Applications are VB / VC++ / C# programs written on .NET Framework.



## .NET Framework Design Goals

- Simplify development
  - More power, less plumbing
- Unify programming models
  - Across all languages and application types
- Utilize web standards and best practices
  - Rich XML, standard protocols, stateless
- Easier to deploy, run, & maintain
  - For components, versioning, availability

When we talk about java so , you have os on that you have **jvm**( jvm make our application machine independent )

IN the same way in .net we have **CLR ---Common Language Runtime**

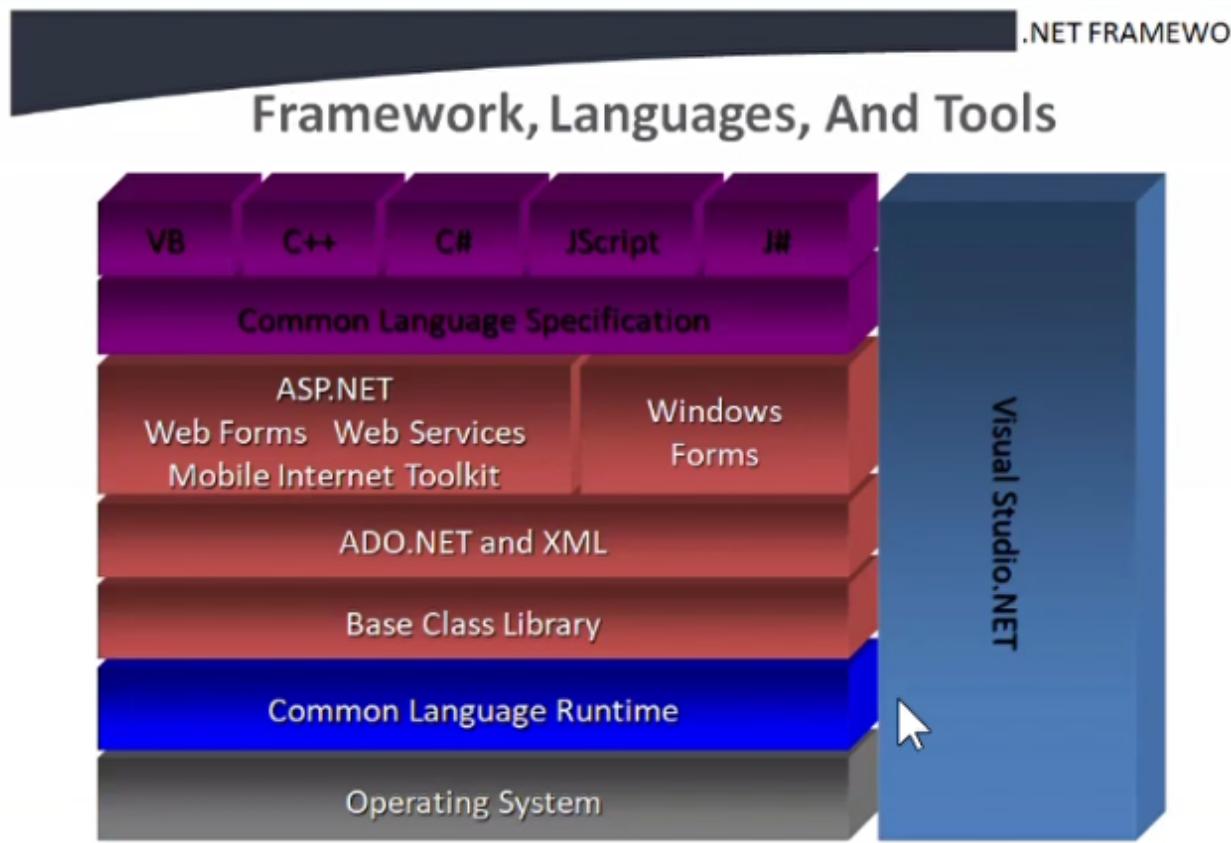
## .NET Framework Components

- Common Language Runtime (CLR)
  - Common type system for all languages
  - Rich runtime environment
- Rich class libraries (.NET Framework)
  - Base class libraries, ADO.NET and XML
  - Windows Forms for rich, Win32 applications
  - Rich, interactive pages
  - Powerful web services



,My CLR help me to execute my application

it becomes a bridge between my os and .net application



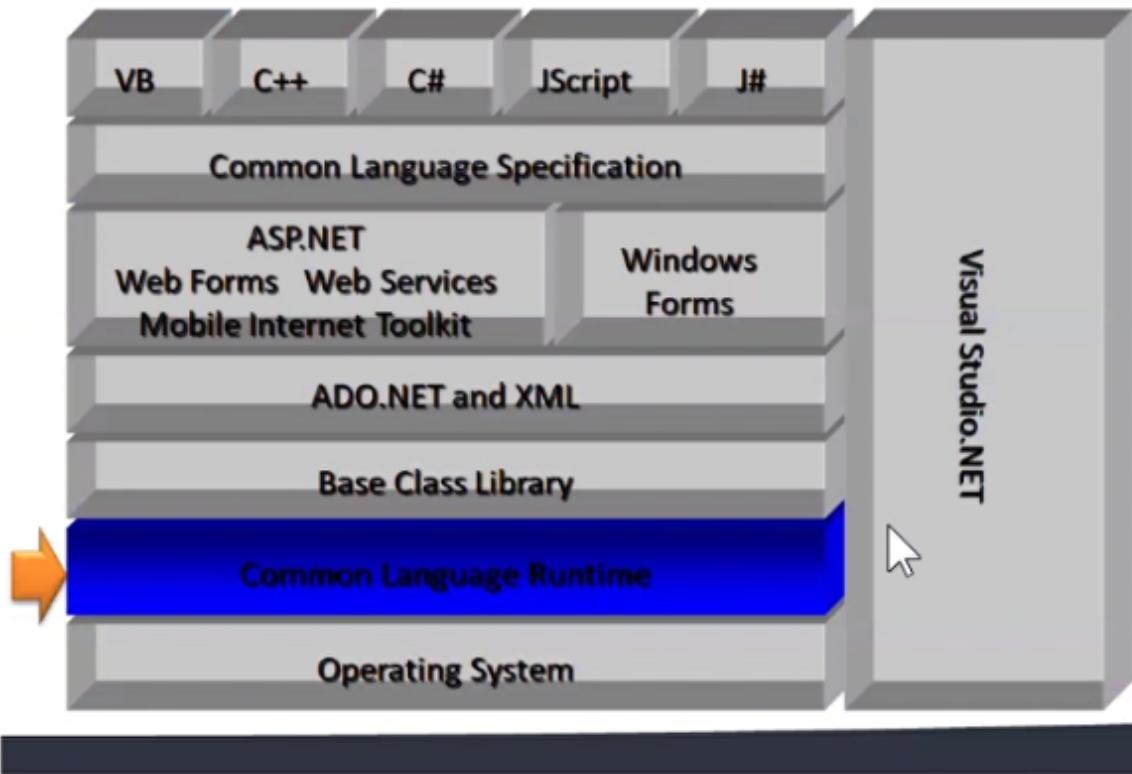
1. .net support many language

Each language has there on compiler

2. CLS is a set of rules and regulation to be followed

3. **ASP.net** used for web application development
4. and **Window forms** is for desktop application development
5. **ADO.net** will help me to connect to different type of data sources Here I am not talking about database (database is a type of data source )so source of data can be a file , it can be a collection ,it can be database , it can be webservice which provides me data.
6. .net has a lot of rich class of library which support all the languages
7. CLR manage my object and other thing memory management and all will be taken care by this guy
8. Visual studio help me to develop my application (any sort of application)

## Common Language Runtime (CLR)

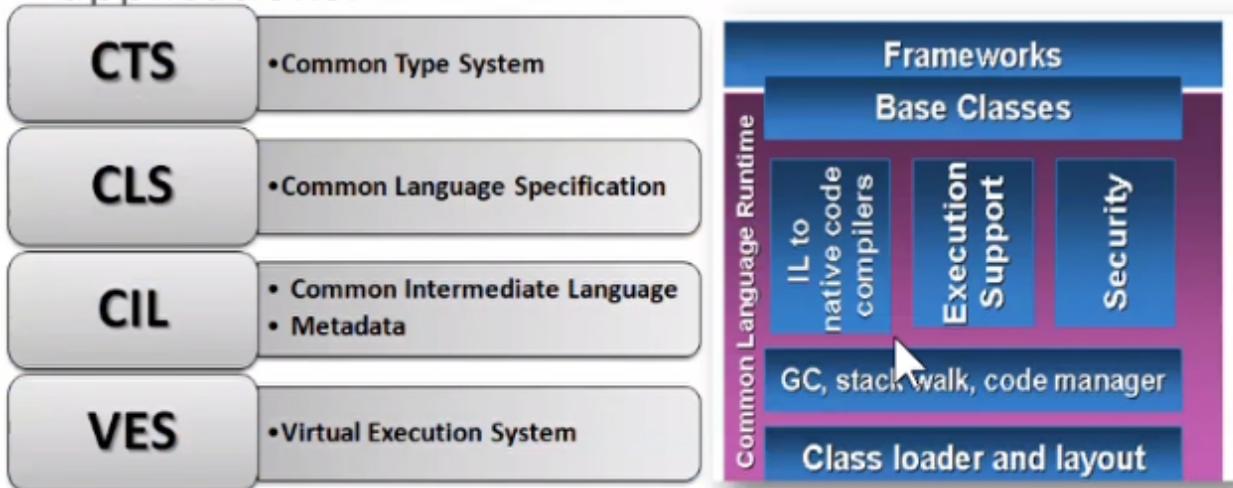


Now when ever you talk about .net , so i wan't to develop a .net application so you have to follow some steps

1. Pick the language (In our case we pick C# because both .net and c# is developed by microsoft)
2. select the platform where you gone to run the application (Target platform)
3. Type of application you want to build weather you a developing a webapplication or you are developing a desktop application, you can create class liabraries also

## Common Language Runtime - CLR

- The Common Language Runtime is the execution engine for .NET Framework applications:



jes we may talk different languages our mouth speaks (output device) our ear listen(input) but our brain will know only mother tongue so it will convert all the language in our mother tongue then we understand

in the same ways my .net support lot of languages my CLR should understand these languages ,so clr has

divided into 4parts

1. **CTS -----** Let i have created a variable

so syntax of [VB.net](#) is-----dim a as string

in C# -----string a;

so when you look into it so a is a same string type but languages are different

so what my **CTS** does is it understand the type you are using here weather it is a string

or object.....what exactly type it is so it **Common Type System**

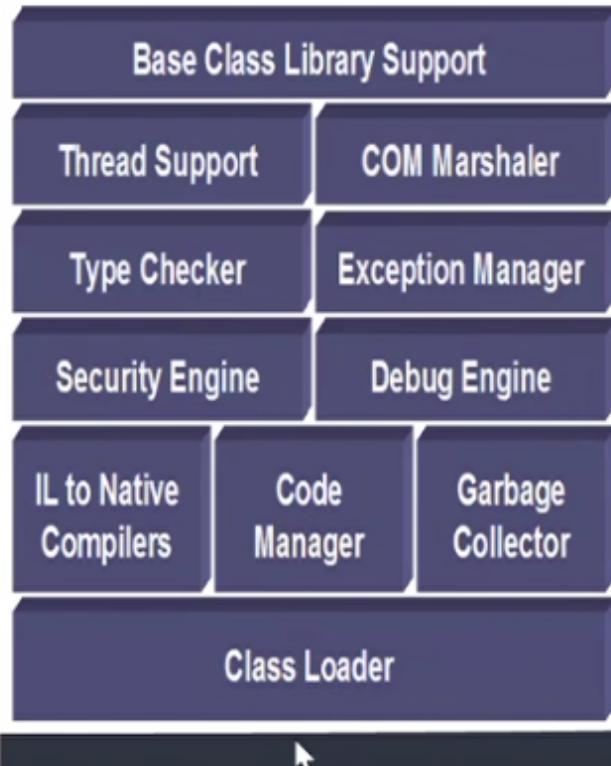
2. **CLS -----** it identifies What is the language we are using **C# or VB.net** it tells

if the language is this one this is exactly what you need to do **Common**

**language Specification**

3. **CIL-----**This is a language which will be translated From the heigh level language it is a common language because from the common language it is easy for me to understand and if it is translated to one common language so from the common language it will be easy for me to understand and if its translated to one common language so it will gone to help me to translate that to what ever the language i wan't
4. **VES-----Virtual Execution System** which will help me to execute it

## Common Language Runtime



- Manages running code
  - Verifies type safety
  - Provides garbage collection, error handling
  - Code access security for semi-trusted code
- Provides common type system
  - Value types (integer, float, user defined, etc)
  - Objects, Interfaces
- Provides access to system resources
  - Native API, COM interop, etc

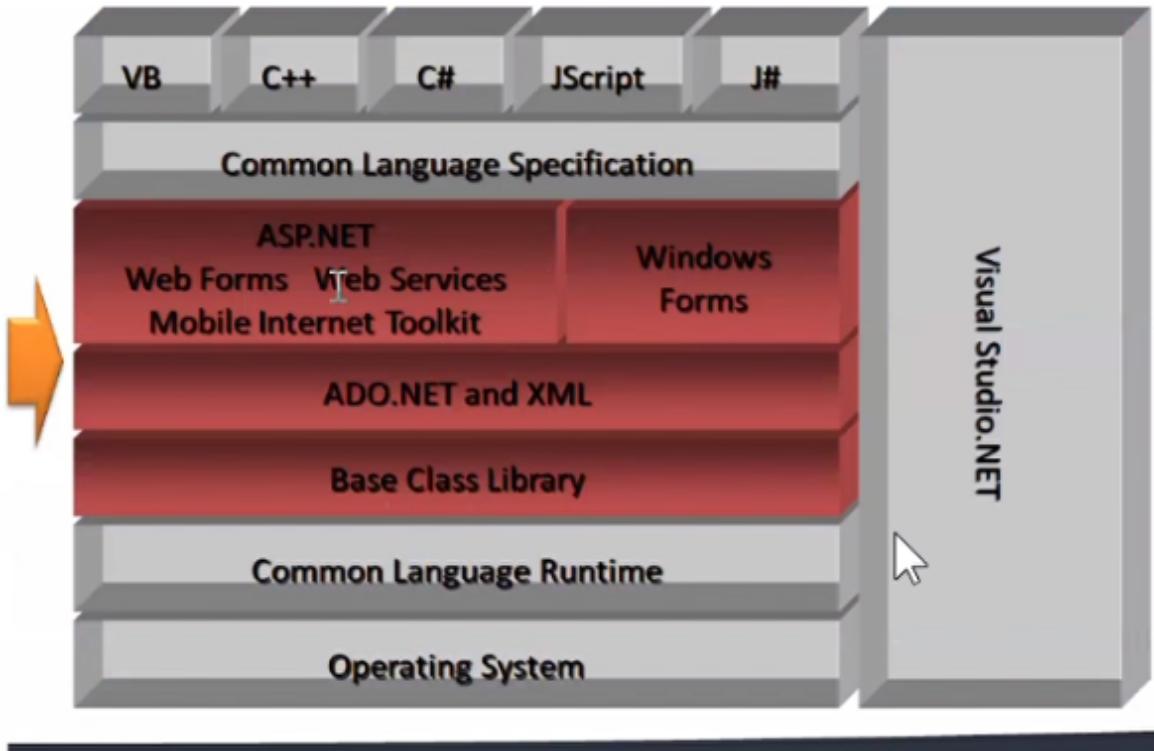
now in **CLR** we have

1. **Class Loader** ---which help me to load particular class

2. **IL to Native Compiler** ---Intermediate Language to native code compiler
3. **Code Manager** ---help me to convert particular code
4. **Garbage Collector** ---help me to collect Garbage
5. **Security Engine** ---check for type safety and so many other things
6. **Debug Engine** ---help me to debug my application
7. **Type Checker** ---check for type
8. **Exception Manager** ---help me to manage Exceptions
9. **Thread Support** ---help me to execute multiple threads
10. **Com Marshaler** ---help me for com application
11. **Base Class Library Support** ---help me to support all sorts of languages

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## Base Class Library (BCL)



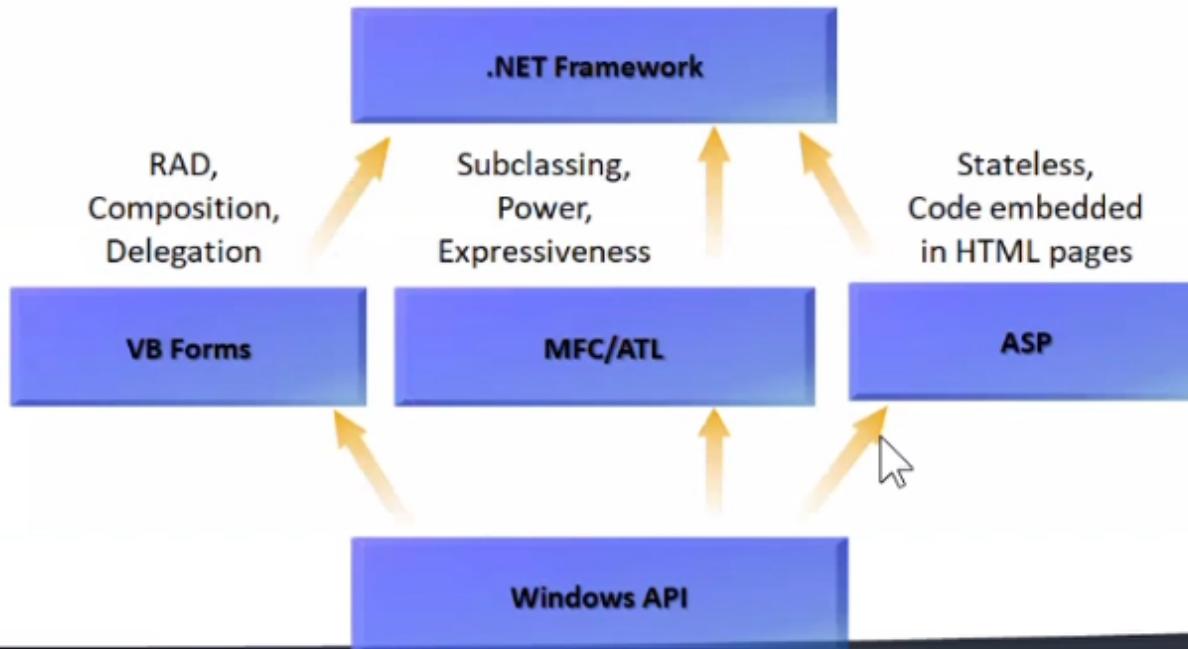
## .NET Framework Libraries

- Single *consistent* set of object oriented class libraries to enable building distributed applications (**Unified Classes**)
- Built using classes arranged across logical hierarchical namespaces
  - For example: `System.Data.SQL`
- Work with all CLR languages
  - No more “VBRUN” or “MFC” divide



## Unify Programming Models

Consistent API availability regardless of language and programming model



suppose we have different applications , it may be vb form or mfc or asp will always been executed by my .net application and my windows Api will help me to fireup all of

them and my .net will help me to execute it

.NET FRAMEW

## How Much Simpler?

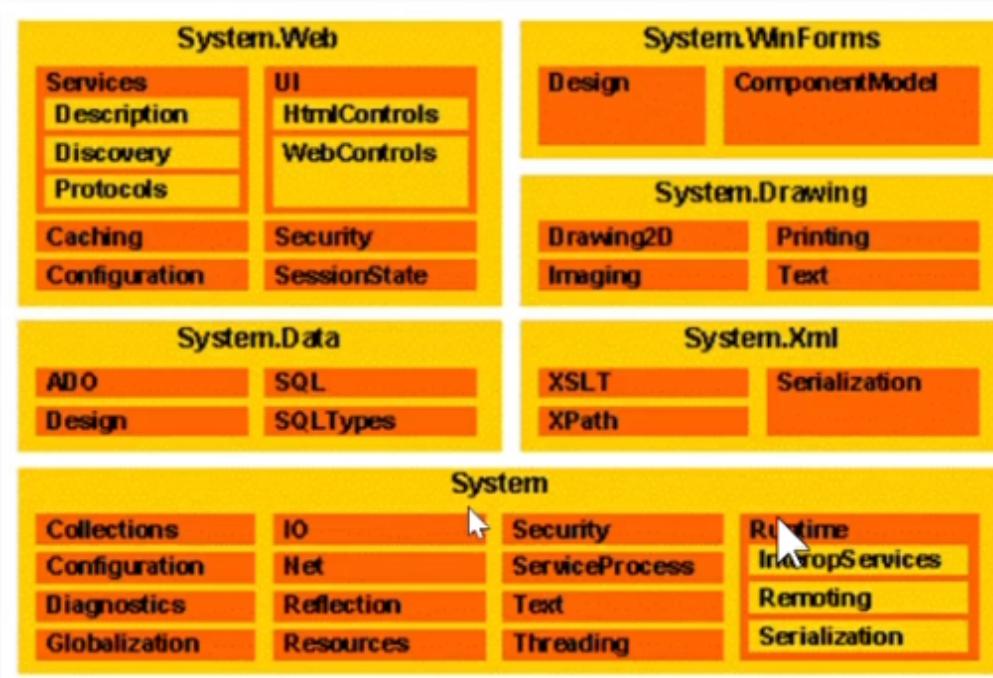
### Windows API

```
HWND hwndMain = CreateWindowEx(
    0, "MainWClass", "Main Window",
    WS_OVERLAPPEDWINDOW | WS_HSCROLL | WS_VSCROLL,
    CW_USEDEFAULT, CW_USEDEFAULT,
    CW_USEDEFAULT, CW_USEDEFAULT,
    (HWND) NULL, (HMENU) NULL, hInstance, NULL);
ShowWindow(hwndMain, SW_SHOWDEFAULT);
UpdateWindow(hwndMain);
```

### .NET Framework

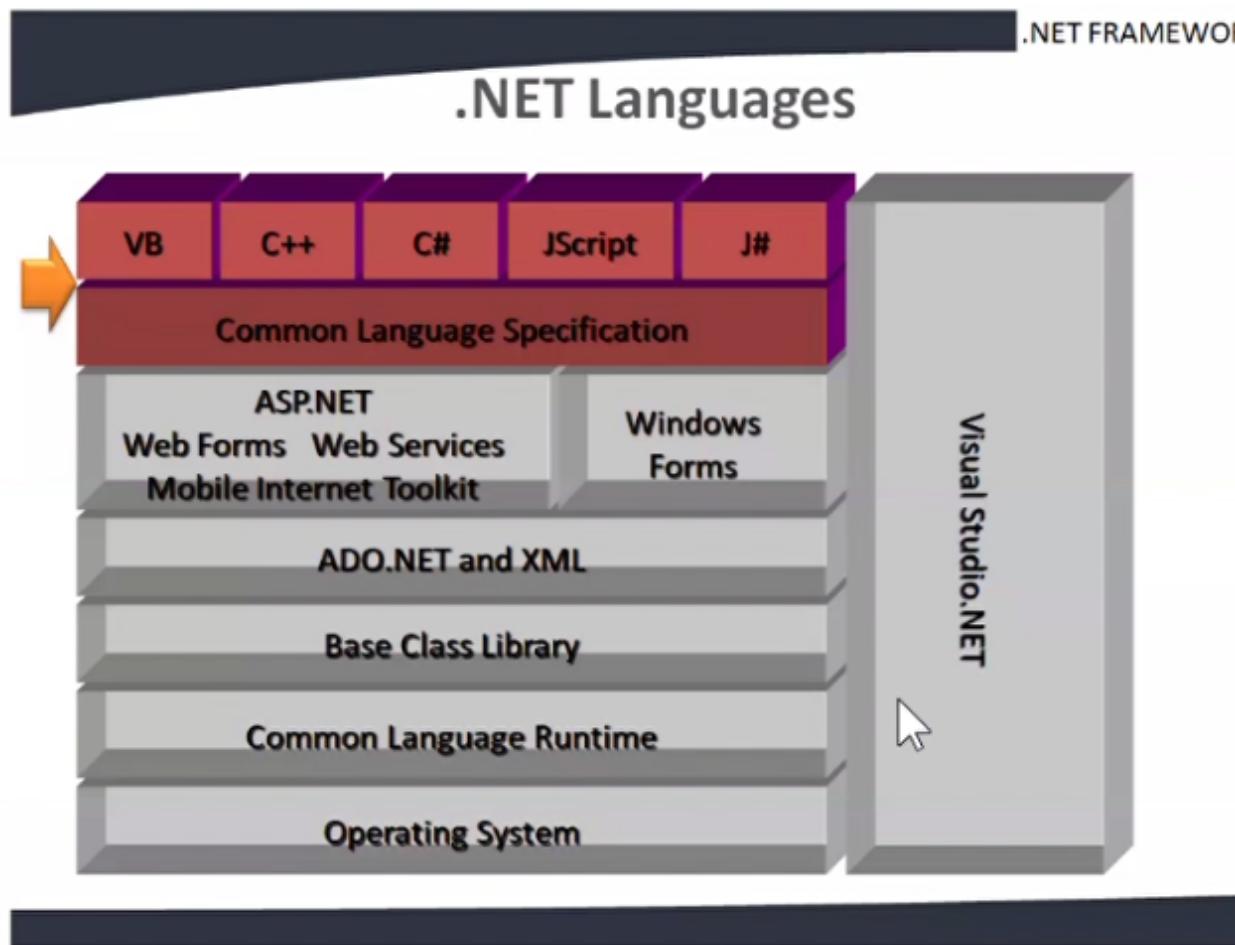
```
Form form = new Form();
form.Text = "Main Window";
form.Show();
```

## .NET Base Class Libraries



these are the main libraries what we have every thing starts with system and system is a main library which support for collections,

configurations.....



.Net support different type of languages based on your skill if i am a cobol developer i can develop a particular application in cobol and push that particular code , if i am a VB 6 developer i can develop a particular application in VB 6 and push that particular code , meaning i can have one big application can be divided into smaller projects each project can be in different language

For Ex:- I am very good in VB 6 and i come to .net so i can use [vb.net](#) my syntax would be little different

my friend is there who is good in C# he can build the whole application in C# now vb application and this application can exchange the data they can talk to each other , i can call some function of there assembly that is possible

## .Net Languages

- The .NET Platform is language neutral
  - All .NET languages are first class players
  - You can leverage your existing skills
- Common language specification
  - Set of features guaranteed to be in all languages

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## .NET Languages from Microsoft

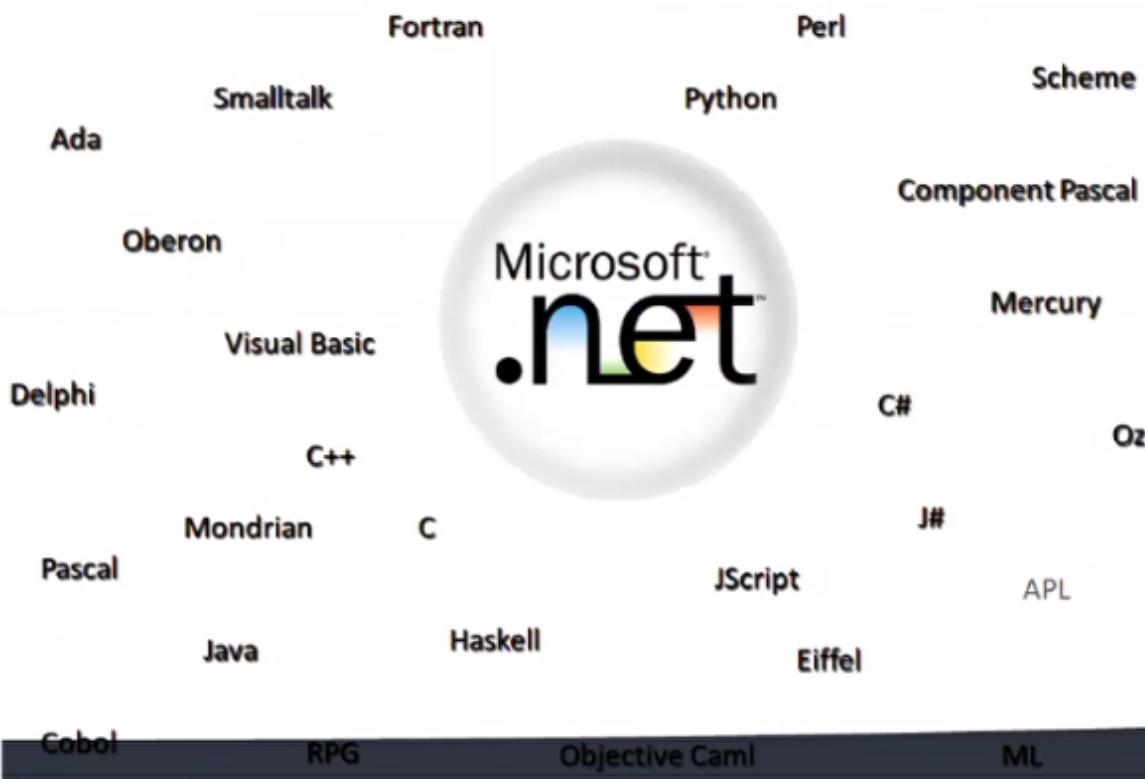
- Microsoft: Visual Basic.NET
- Microsoft: C#
- Microsoft: F#
- Microsoft: C++ Managed
- Microsoft: Jscript.Net
- Microsoft: J#

I

## .NET Languages from Others

- APL
- Fujitsu COBOL
- Micro Focus COBOL
- Eiffel
- Forth
- FORTRAN 95
- Haskell
- Mercury
- Mondrian
- Oberon
- Pascal
- Perl
- Python
- RPG
- S#
- Scheme
- Standard Meta Language

## Multilingual Development



We will be using C# as a language because that is something which is developed by .Net from the scratch and any new implementation what they are bringing they will

bring into C#

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## The .NET Platform is multi-language

- **Benefits:**
  - Make code modules reusable
  - Complete cross-language integration
  - Make API access the same for all languages
  - Let developers use the right language for the task and share the code
- **All .NET languages are first-class players**
  - Performance roughly equal
  - Can use all .NET features

**Assignment - Do reading on API**

## Multi Language Support

Dim s as String s = "authors" Dim cmd As New SqlCommand("select * from " & s, sqlconn) cmd.ExecuteReader()	VB.NET
string s = "authors"; SqlCommand cmd = new SqlCommand("select * from "+s, sqlconn); cmd.ExecuteReader();	C#
String *s = S"authors"; SqlCommand cmd = new SqlCommand(String::Concat(S"select * from ", s), sqlco cmd.ExecuteReader();	C++
String s = "authors"; SqlCommand cmd = new SqlCommand("select * from "+s, sqlconn); cmd.ExecuteReader();	J#
var s = "authors" var cmd = new SqlCommand("select * from " + s, sqlconn) cmd.ExecuteReader()	JScript
s = "authors" cmd =SqlCommand("select * from " + s, sqlconn) cmd.ExecuteReader()	Python

some syntax of languages which .net support  
so logic remain same its only the syntaxes which you have to learn

## Multi Language Support

```
ENVIRONMENT DIVISION.  
CONFIGURATION SECTION.  
REPOSITORY.  
    CLASS SqlCommand AS "System.Data.SqlClient.SqlCommand"  
    CLASS SqlConnection AS "System.Data.SqlClient.SqlConnection".  
DATA DIVISION.  
WORKING-STORAGE SECTION.  
01 str PIC X(50).  
01 cmd-string PIC X(50).  
01 cmd OBJECT REFERENCE SqlCommand.  
01 sqlconn OBJECT REFERENCE SqlConnection.  
PROCEDURE DIVISION.  
    *> Establish the SQL connection here somewhere.  
MOVE "authors" TO str.  
STRING "select * from " DELIMITED BY SIZE,  
      str DELIMITED BY " " INTO cmd-string.  
INVOKE SqlCommand "NEW" USING BY VALUE cmd-string sqlconn RETURNING cmd.  
INVOKE cmd "ExecuteReader".
```

COBOL

```
assembly_external(name="System.Data.SqlClient.SqlCommand")  
sqlcmdcharacter*10 xsqcmd  
Cmd x='authors'  
cmd = sqcmd("select * from //x, sqlconn")  
call cmd.ExecuteReader()  
end
```

Fortran

## Multi Language Support

```
|s| := 'authors'.
|cmd| := SqlCommand('select * from '+s, sqlconn).
cmd.ExecuteReader().
```

Smalltalk

```
(let* ( (s "authors")
        (cmd (new-SqlCommand (string-append "select * from " s) sqlconn)
        (execute-command cmd))
```

Scheme

```
local
  s: STRING
  cmd: SQLCOMMAND
do
  s := "authors"
  create cmd("select * from " + s, sqlconn)
  cmd.ExecuteReader()
end
```

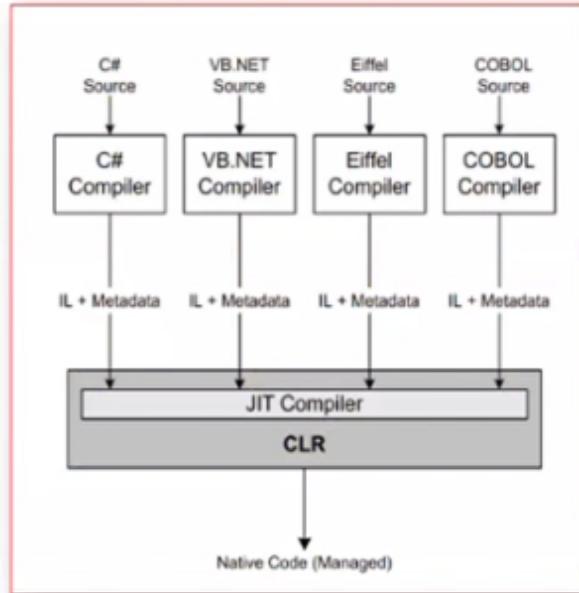
Eiffel

```
ExecuteReader = invoke System.Data.SqlClient.ExecuteReader();
SqlCommand = create System.Data.SqlClient.SqlCommand(String,\n            System.Data.SqlClient.SqlConnection);
query = sqlconn -> let{ s = "authors"; } in {
  cmd <- SqlCommand ("select * from "+s, sqlconn);
  cmd # ExecuteReader();
};
```

Mondrian

## All Languages are compiled to IL code

.NET FRAMEWORK



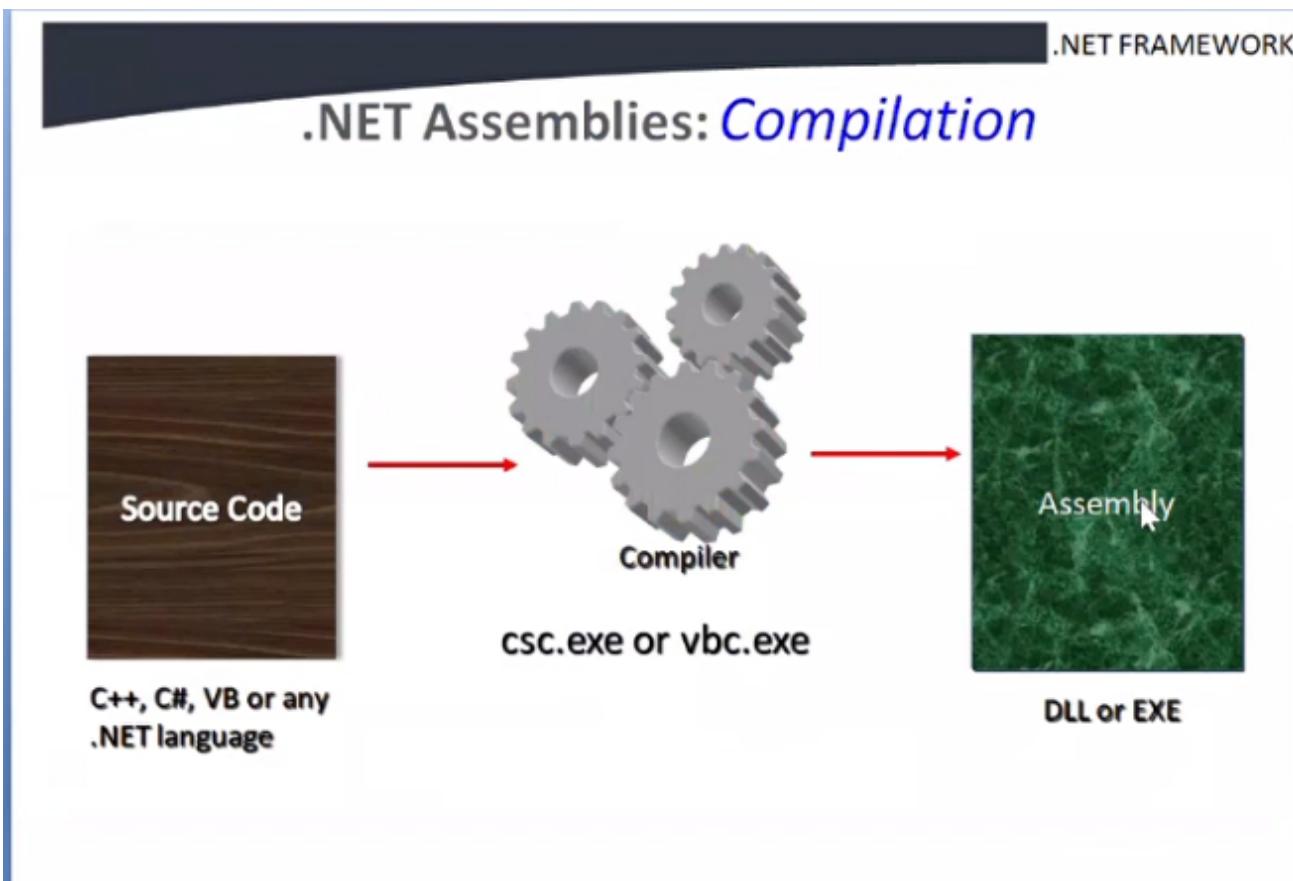
How my Program run?

you gone to have a language

each language have their own compiler , compiler compiles the particular program, a meta file will be created

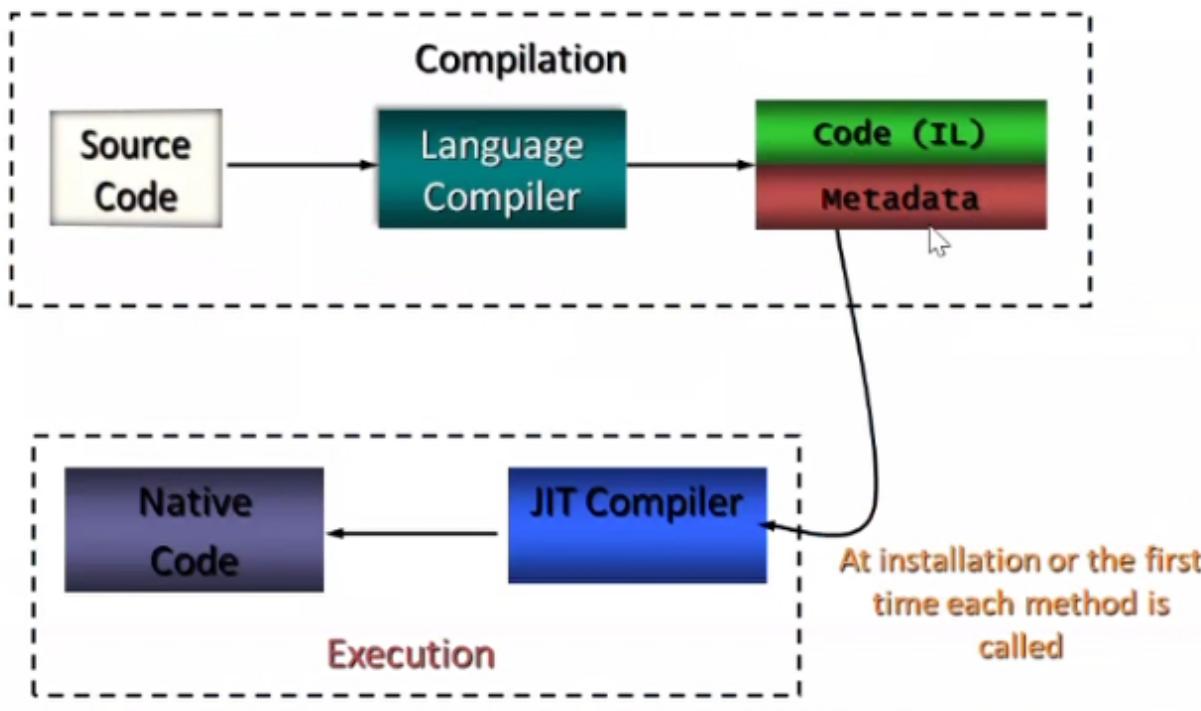
meta file will be a combination of IL + metadata so this file is called as assembly and that assembly will be pushed back to your clr , CLR will gone to have a JIT compiler which will compiler each and every code

which you have on demand and executes it    that's how like .Net is much faster as compare to java ,execution of .net is much faster as compare to java, you cannot compare java and .net



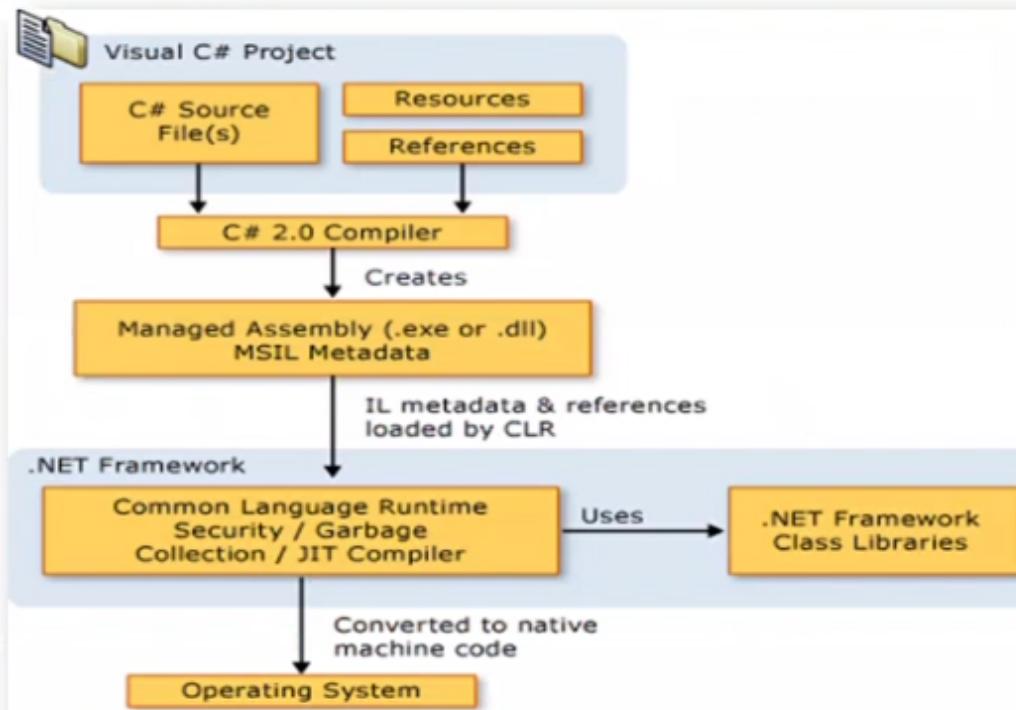
I Compile my source code , as soon as i compile it will bring in a new file based on this weather it is a executable file or it is a library, we have 2 different types of file which will be created .exe for executable file , .dll for library  
you cannot directly execute the dll where as you can directly run the .exe

## Compilation And Execution



native means OS related code

## .NET Execution Model

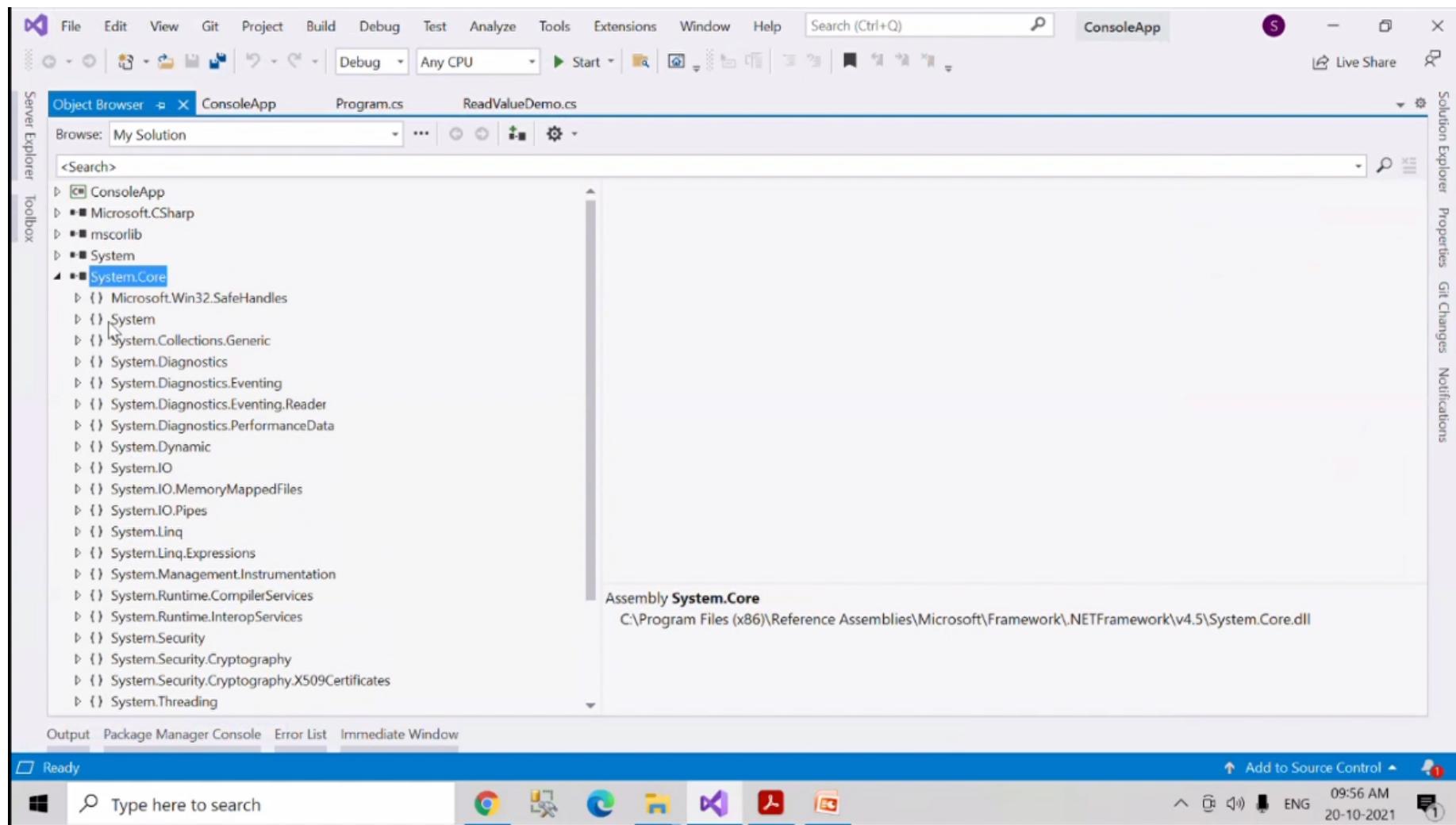


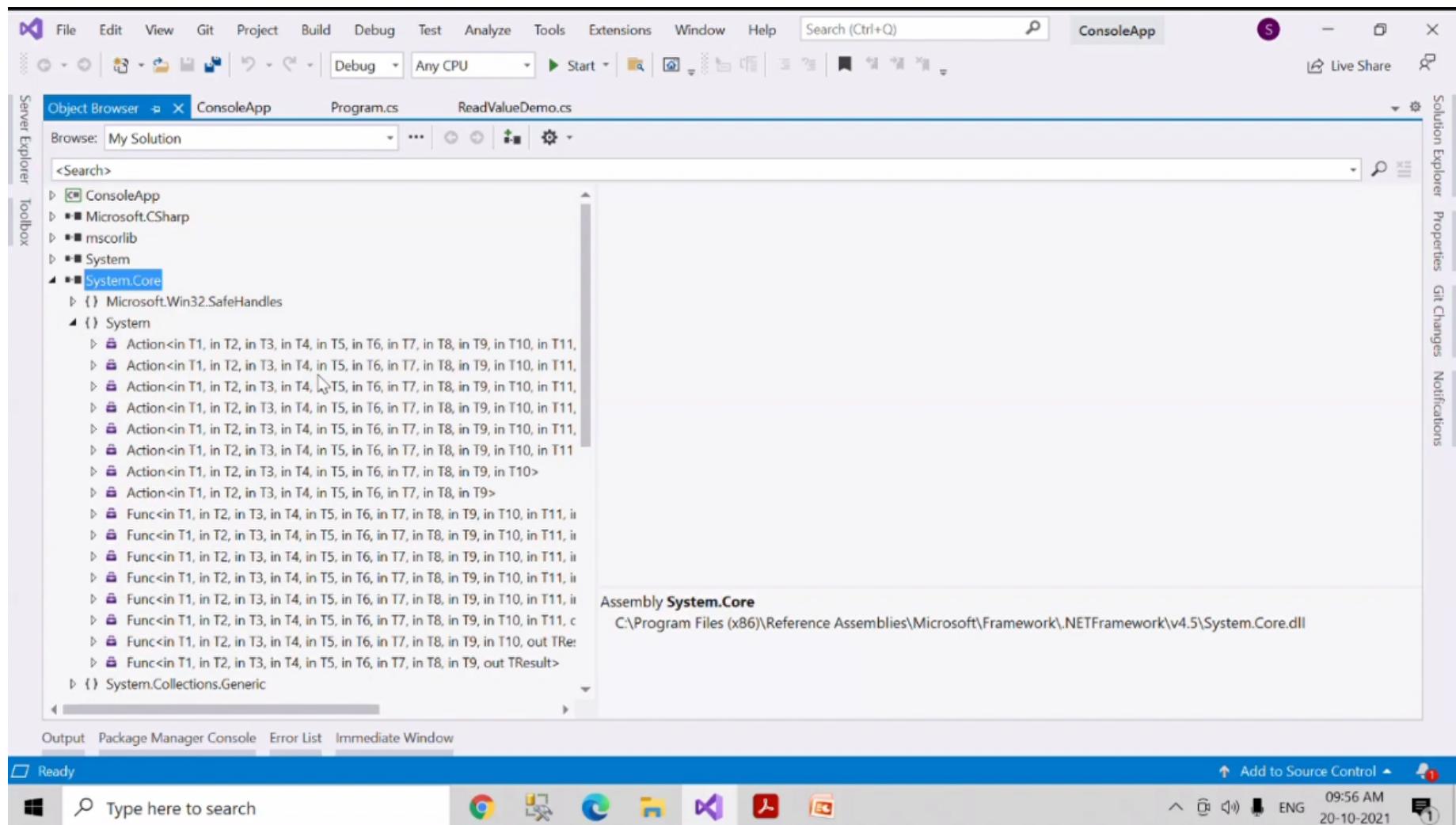
The screenshot shows the Microsoft Visual Studio IDE interface. The main window displays the code editor with a C# program named `ConsoleApp`. The code prints a multi-line string to the console, followed by "Hi", "Hello", "Welcome", and then reads input from the user.

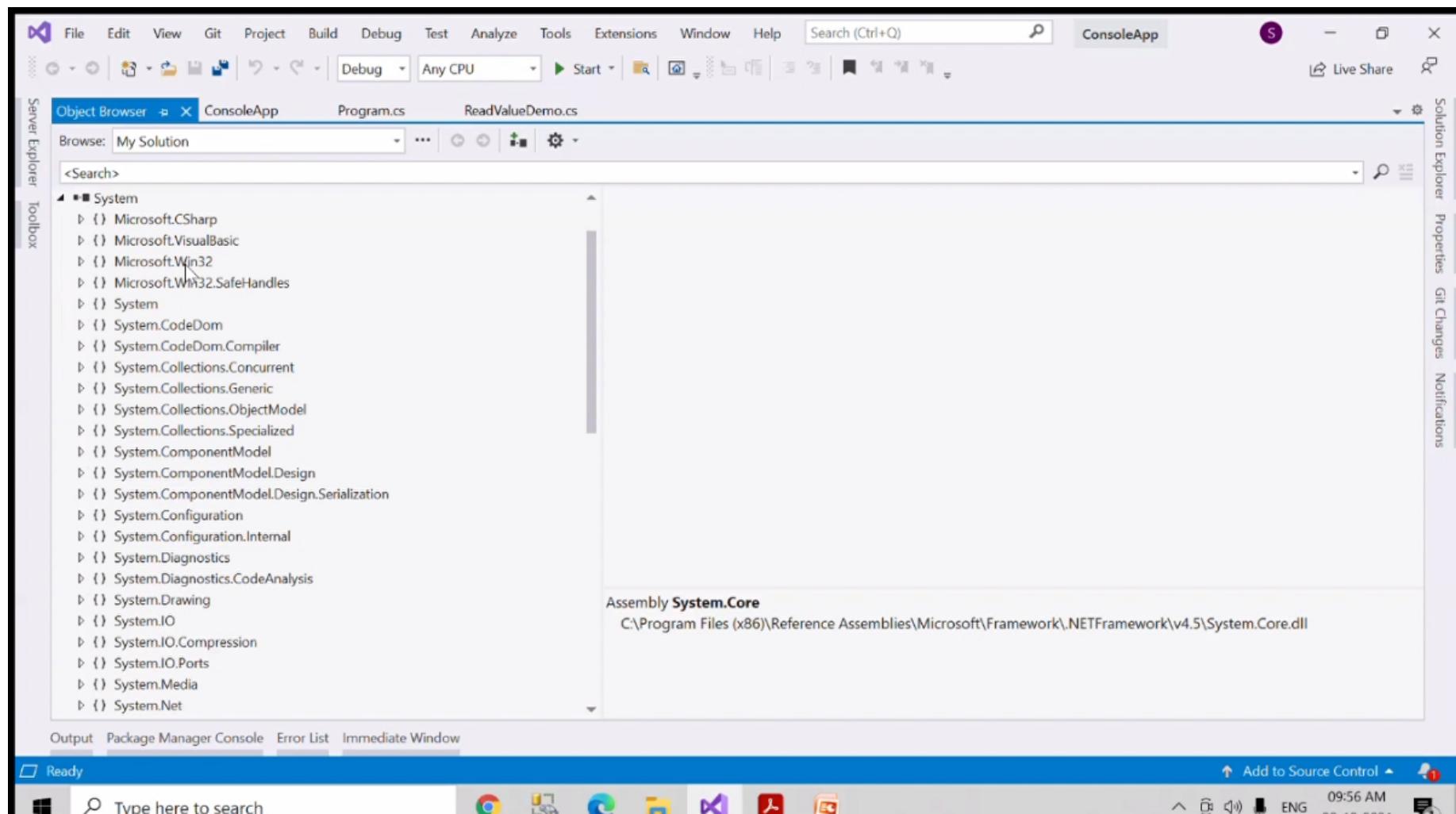
```
1  using System;
2
3  namespace ConsoleApp
4  {
5      class Program
6      {
7          static void Main()
8          {
9              Console.WriteLine("Hi\n\tShashi\n\tHow\n\tAre\n\tYou?");
10             Console.WriteLine("Hi");
11             Console.WriteLine("Hello");
12             Console.Write("Welcome");
13             Console.ReadLine();
14         }
15     }
16 }
17
```

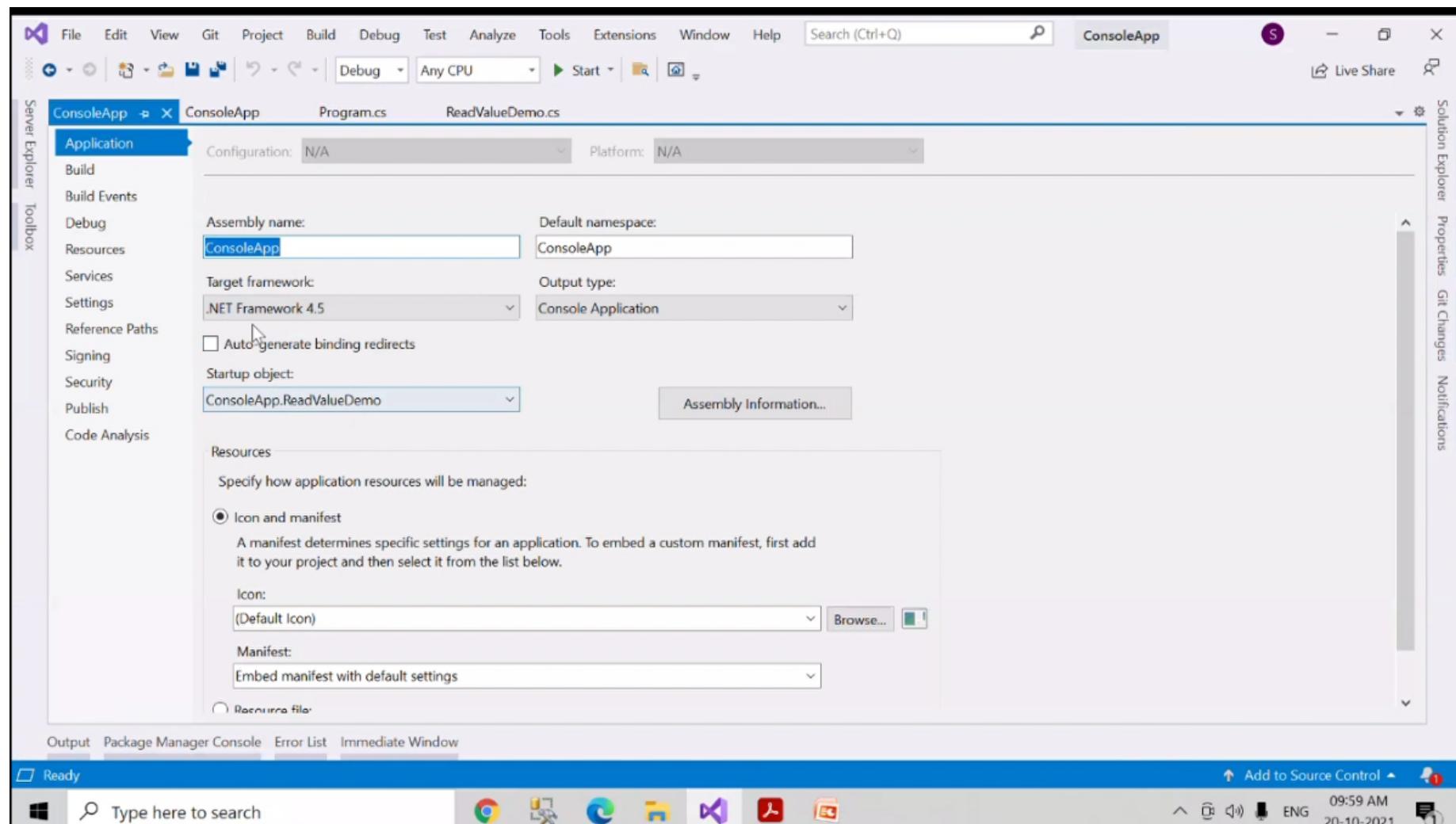
The Solution Explorer on the right shows the project structure, including references to `System.Core`, `System`, and `System.Xml.Linq`.

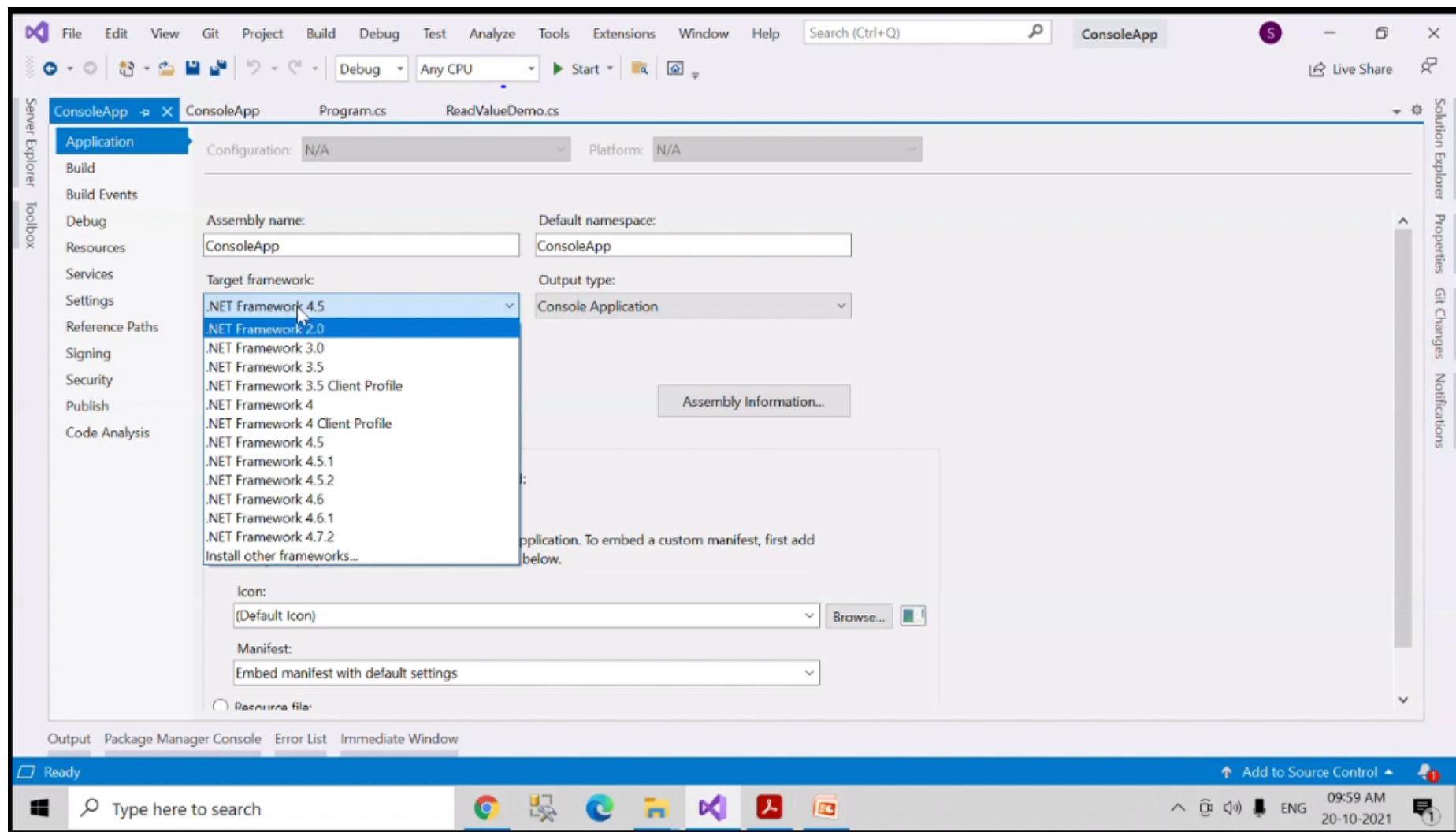
At the bottom, the taskbar shows the Windows Start button, a search bar, and pinned icons for Google Chrome, File Explorer, Visual Studio Code, Task View, and File Explorer. The system tray shows the date and time as 09:56 AM on 20-10-2021.

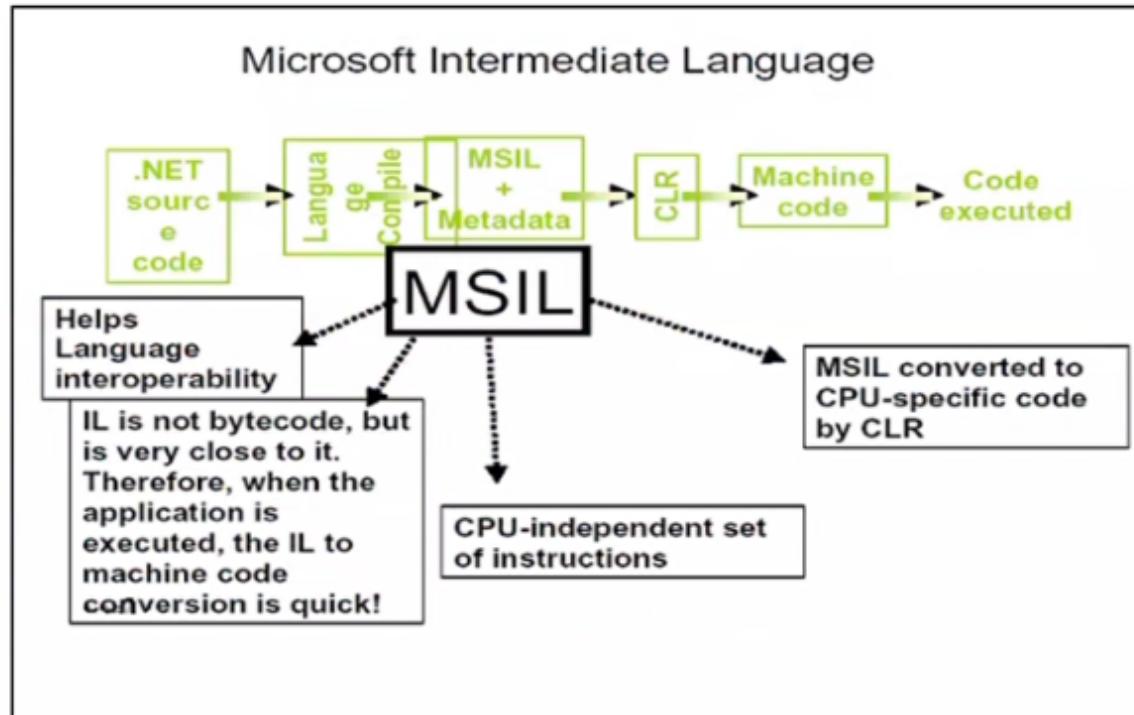






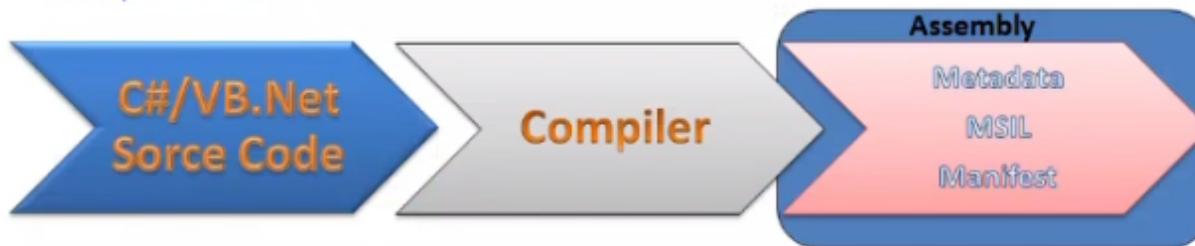






## Metadata and IL Code

*Example: Hello World!*



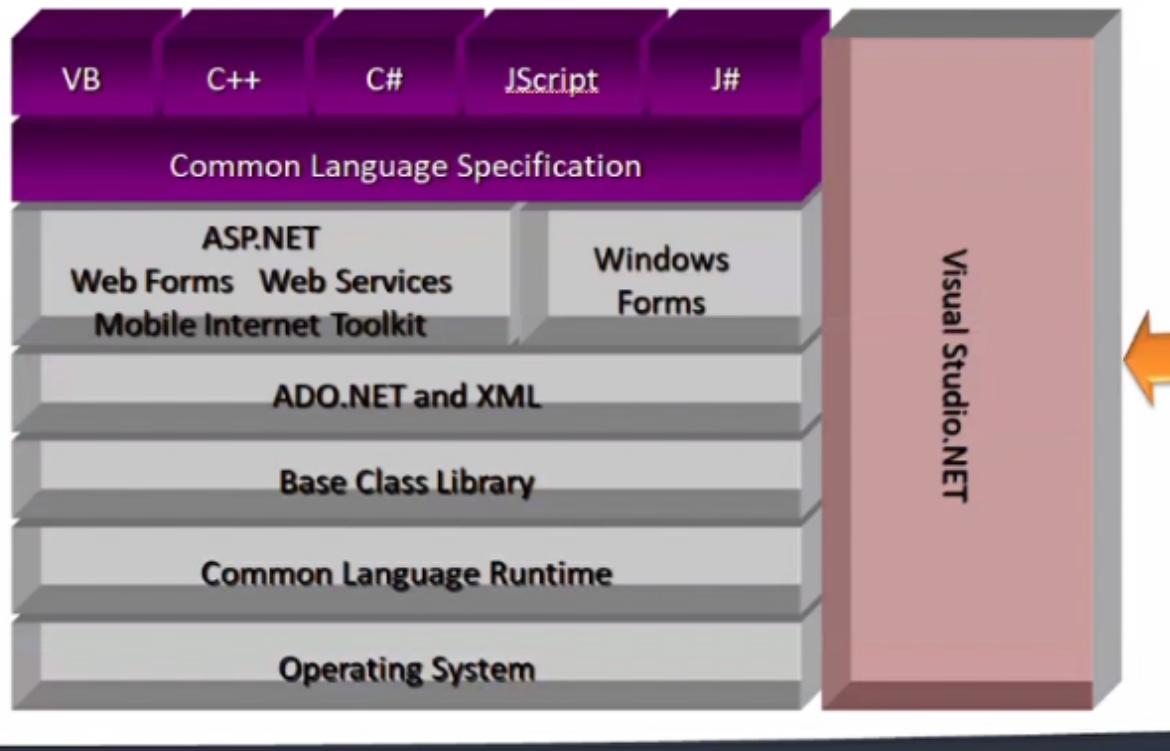
- **Metadata:**
  - data about data; description of assembly, description of types, attributes
  - objects can communicate with each other
  - Stored in binary format, CLR loads metadata into memory for reference
- **IL code:**
  - intermediate language, CPU independent sets of instructions
- **Assembly:**
  - a basic unit of versioning, deployment, security management, execute, reuse and sharing.
- **Manifest:** Assembly Metadata

## Portable Executable (PE)



.NET FRAMEWORK

## Visual Studio.NET



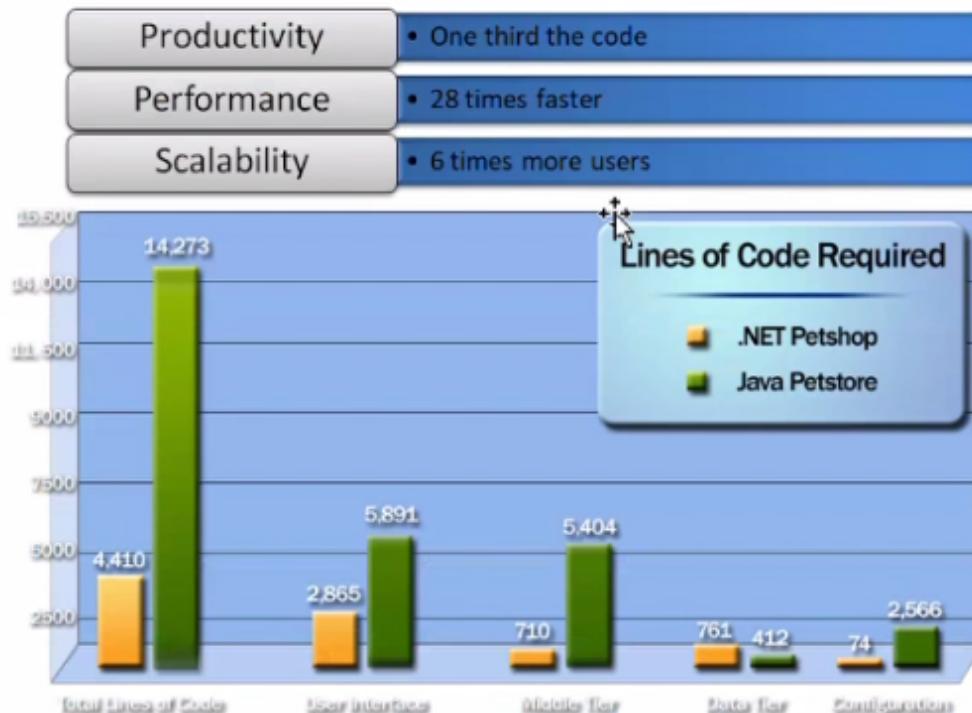
## Visual Studio .NET

- Comprehensive best-of-breed tool for building connected applications based on .NET for Windows and the Web
- All languages under one roof
- All application types under one roof
- Consistent programming model for all application types
- Enterprise Lifecycle Support (VSS, Visio, Enterprise Templates)

## Visual Studio.NET

- Integrated Development Environment
  - Visual Basic.NET
    - Many language enhancements
    - Inheritance, Overloading, Free Threading
  - Visual C++
    - Integration with .NET Framework with managed extensions (classes)
  - C#
    - New development language
    - Based on C/C++ with Garbage Collection/Memory Management

## Developer Productivity



## ADO.NET

- ADO.NET is a set of software components that can be used by applications to access data and data services.
- It's included as a part of .Net Framework.
- ADO.NET can access data from relational and non-relational sources.
- ADO.NET is considered as an evolution of ADO technology (ActiveX Data Objects)
  - ADO.NET is extensively changed to support the new technology.

# Architecture

- ADO.NET Consists of two major parts
  - Data Provider
    - Provide access to the data sources
    - Each Datasource has its own set of provider objects
    - They share common set of utility classes
      - Connection
      - Command
      - Parameter
      - DataAdapter
      - DataReader
  - DataSets
    - DataSet is group of classes describing a simple in-memory relational database
      - DataTable
      - DataView
      - DataColumn
      - DataRow
      - DataRelation
      - DataConstraint

## ASP.NET

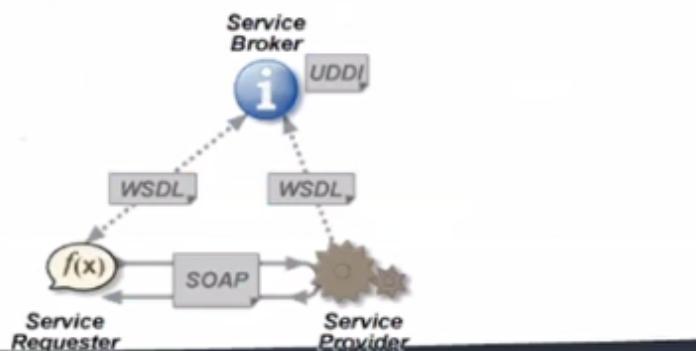
- **ASP.NET** is a web application framework developed and marketed by Microsoft to allow programmers to build
  - Dynamic web sites
  - Web applications
  - Web services.
- It was first released in January 2002 with version 1.0 of the .NET Framework and is the successor to Microsoft's Active Server Pages (ASP) technology.
- ASP.NET is built on the Common Language Runtime (CLR), allowing programmers to write ASP.NET code using any supported .NET language.

## AJAX With ASP.NET

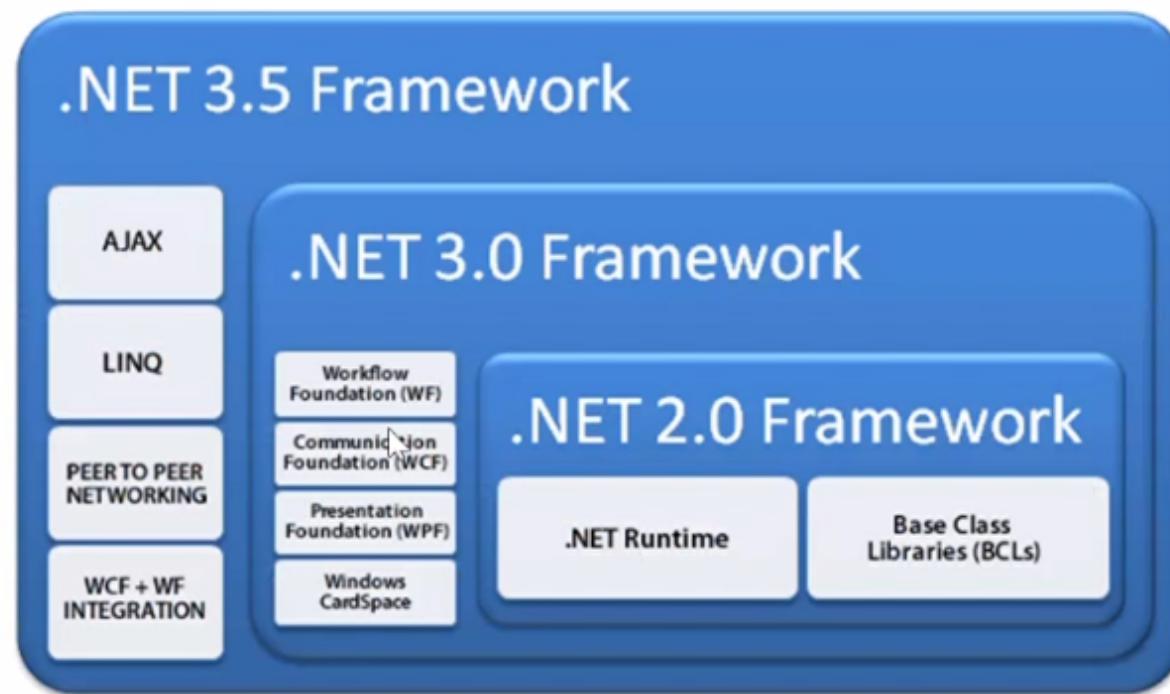
- **ASP.NET AJAX** is a set of extensions to ASP.NET developed by Microsoft for implementing Ajax functionality.
- AJAX for ASP.NET was originally code named as ATLAS
- AJAX stands for Asynchronous JavaScript and XML.
- It's a group of interrelated web development techniques used on the client side to create interactive or rich web applications
- With AJAX, the web application can retrieve the data from the server without refreshing the page

## WebService

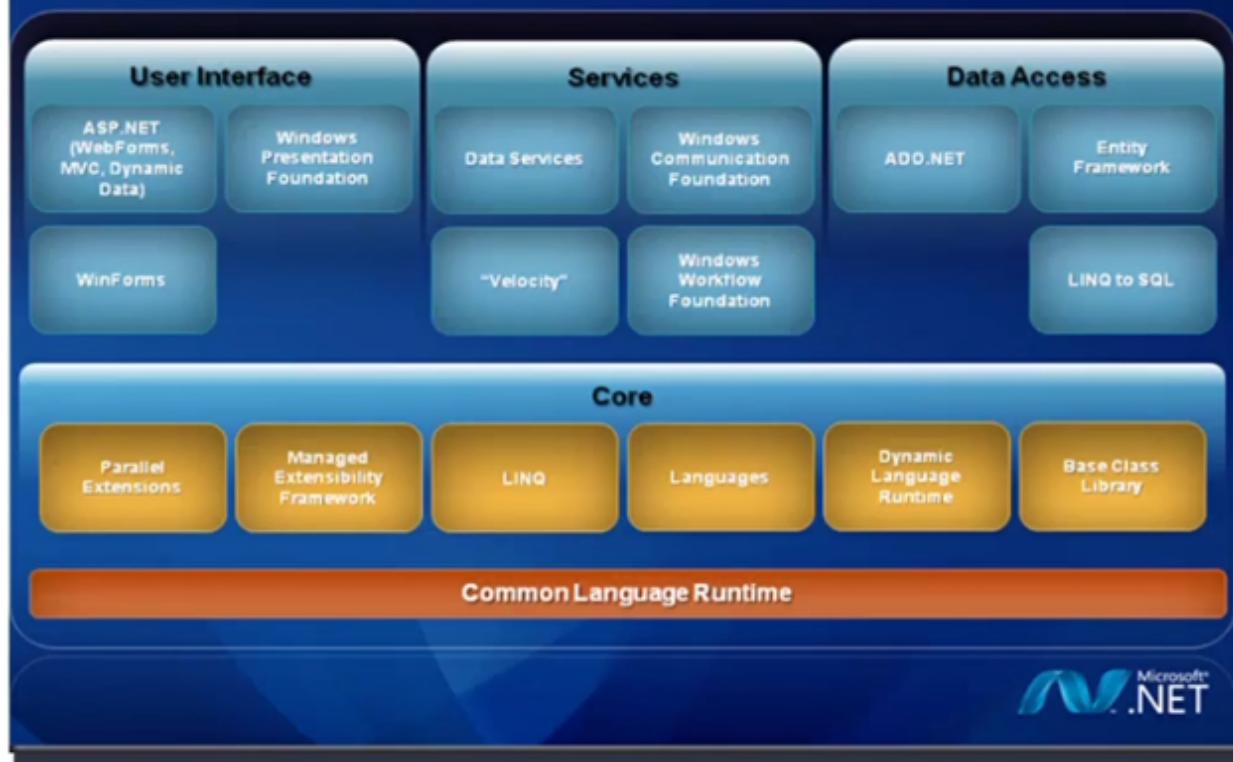
- A **Web Service** is defined by the W3C as
  - A software system designed to support interoperable machine-to-machine interaction over a network
  - It has an interface described in WSDL format.
  - Other systems interact with the Web service using SOAP
  - These SOAP messages are conveyed over HTTP with XML Serialization
- Web Service is also called as Internet API



## The .NET Framework Stack



# .NET Framework 4.0



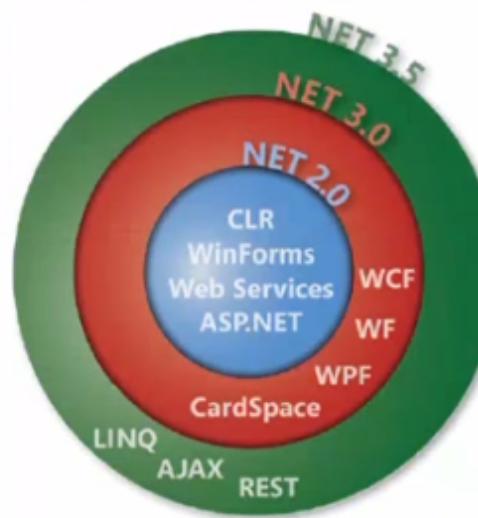
## .NET FRAMEWORK

### The .NET Framework Stack



## .Net Framework History

- .NET Framework 1.0 - January 2002
  - Initial release
- .NET Framework 1.1 - April 2003
  - Mobile ASP.NET Support
  - Security Enhancements
  - ODBC/Oracle Support
  - .NET Compact Framework
  - IPv6 Support
  - Various API Changes
- .NET Framework 2.0 - November 2005
  - Generics!
  - Hosting API
  - 64-bit Support
  - ASP.NET enhancements(web controls, personalisation)
  - Data Controls with Declarative Data Binding
  - .NET Micro Framework
  - Various API Changes
- .NET Framework 3.0 - November 2006
  - Windows Presentation Framework
  - Windows Communication Framework
  - Windows Workflow Foundation
  - Windows CardSpace
- .NET Framework 3.5 – November 2007
  - ASP.NET AJAX
  - LINQ
  - Various API Changes
- .NET Framework 4.0 – April 2010
  - MEF, TPL, PLINQ, DLR, MVC, ADO.NET EF



Additive versions of the .NET Framework

## Summary

- The .NET Framework
  - Dramatically simplifies development and deployment
  - Unifies programming models
  - Provides robust and secure execution environment
  - Supports multiple programming languages

## .NET CORE

- .NET Core is the latest general purpose development platform maintained by Microsoft.
- It works across different platforms and has been redesigned in a way that makes .NET fast, flexible and modern.
- .NET Core happens to be one of the major contributions by Microsoft.
- Developers can now build Android, iOS, Linux, Mac, and Windows applications with .NET, all in Open Source.

## Characteristics of .NET Core

- **Open source**
  - .NET Core is an open source implementation, using MIT and Apache 2 licenses.
  - .NET Core is a .NET Foundation project and is available on [GitHub](#).
  - As an open source project, it promotes a more transparent development process and promotes an active and engaged community.

## Characteristics of .NET Core

- **Cross-platform**

- Application implemented in .NET Core can be run and its code can be reused regardless of your platform target.
  - It currently supports three main operating systems (OS)
    - Windows
    - Linux
    - MacOS
  - The supported Operating Systems (OS), CPUs and application scenarios will grow over time, provided by Microsoft, other companies, and individuals.
-

## Characteristics of .NET Core

- **Flexible deployment**

- There can be two types of deployments for .NET Core applications –
  - Framework-dependent deployment
  - Self-contained deployment
- With framework-dependent deployment, your app depends on a system-wide version of .NET Core on which your app and third-party dependencies are installed.
- With self-contained deployment, the .NET Core version used to build your application is also deployed along with your app and third-party dependencies and can run side-by-side with other versions.

## Characteristics of .NET Core

- **Command-line tools**
  - All product scenarios can be exercised at the command-line.
- **Compatible**
  - .NET Core is compatible with .NET Framework, Xamarin and Mono, via the .NET Standard Library
- **Modular**
  - .NET Core is released through NuGet in smaller assembly packages.
  - .NET Framework is one large assembly that contains most of the core functionalities.
  - .NET Core is made available as smaller feature-centric packages.
  - This modular approach enables the developers to optimize their app by including just those NuGet packages which they need in their app.
  - The benefits of a smaller app surface area include tighter security, reduced servicing, improved performance, and decreased costs in a pay-for-what-you-use model.