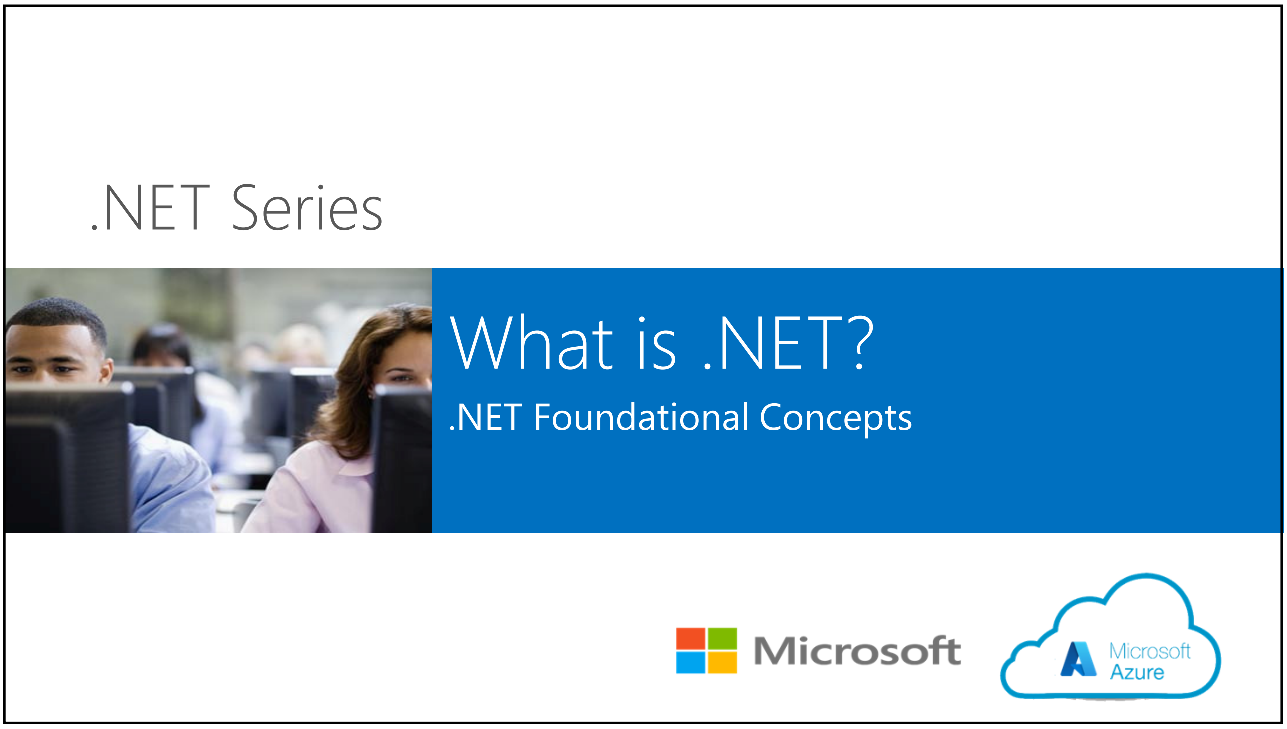


.NET Series

What is .NET?

.NET Foundational Concepts

Microsoft
Microsoft Azure

1

Manoj Kumar Sharma

- Freelance Consultant / Corporate Trainer
- 32+ years of Experience in the Software Industry
  - 23+ years as a Software Architect / Systems Analyst / Project Lead
  - Last Designations held:
    Director of Technology, ExamRoom.AI
    Chief Software Architect, ADP India.
- 17+ years of Corporate Training Experience.
  - Delivered over 1800 in-person trainings across India, US, Oman and Thailand, and over 250 remote trainings in over 12 countries
  - Microsoft Certified Trainer (2012-2025)

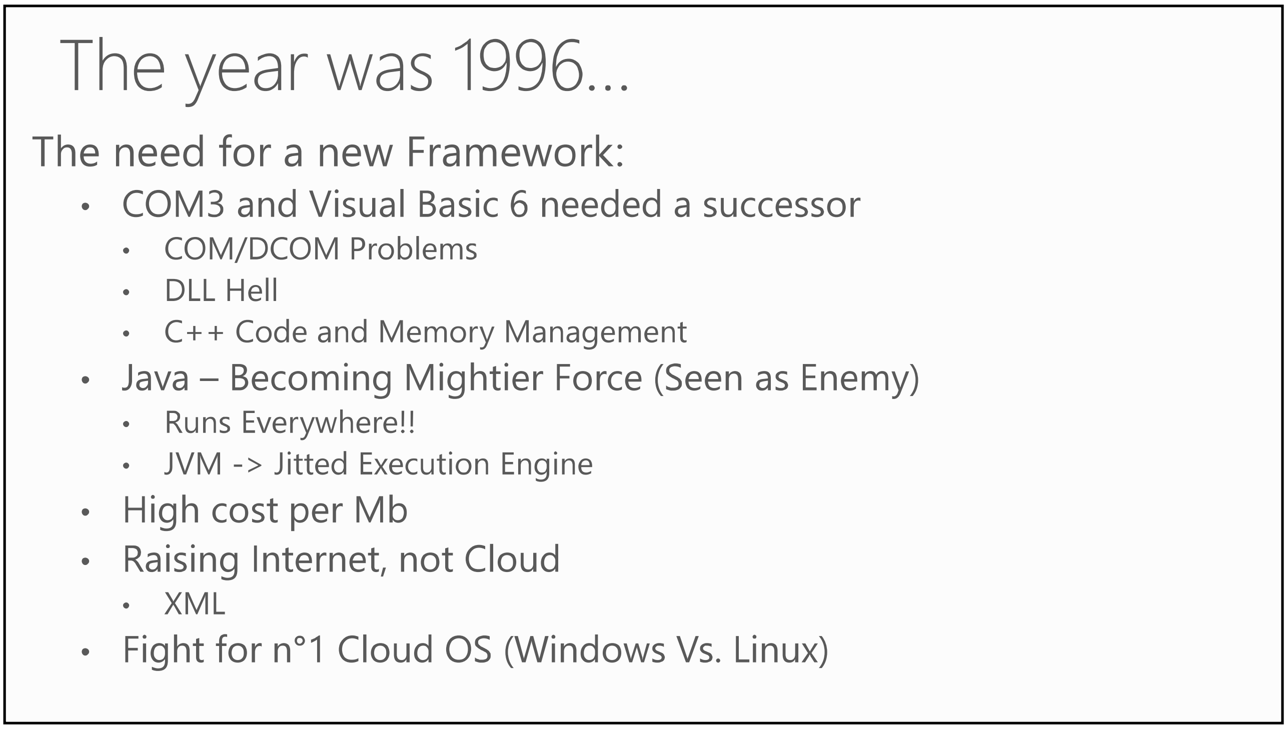
www.manojkumarsharma.com
mailme@manojkumarsharma.com

Microsoft CERTIFIED Professional
Microsoft Office Specialist
Microsoft CERTIFIED Professional Developer
Web Developer
Microsoft CERTIFIED Technology Specialist
MICROSOFT CERTIFIED TRAINER
Microsoft MCT Trainer
2012 - 2025
Microsoft CERTIFIED AZURE DEVELOPER ASSOCIATE
Microsoft CERTIFIED AZURE SOLUTIONS ARCHITECT EXPERT
BLENDED LEARNING
TAE-LLD-3008-1.1
BLENDED LEARNING
TAE-LLD-3002-1.1

2

What is .NET?

3

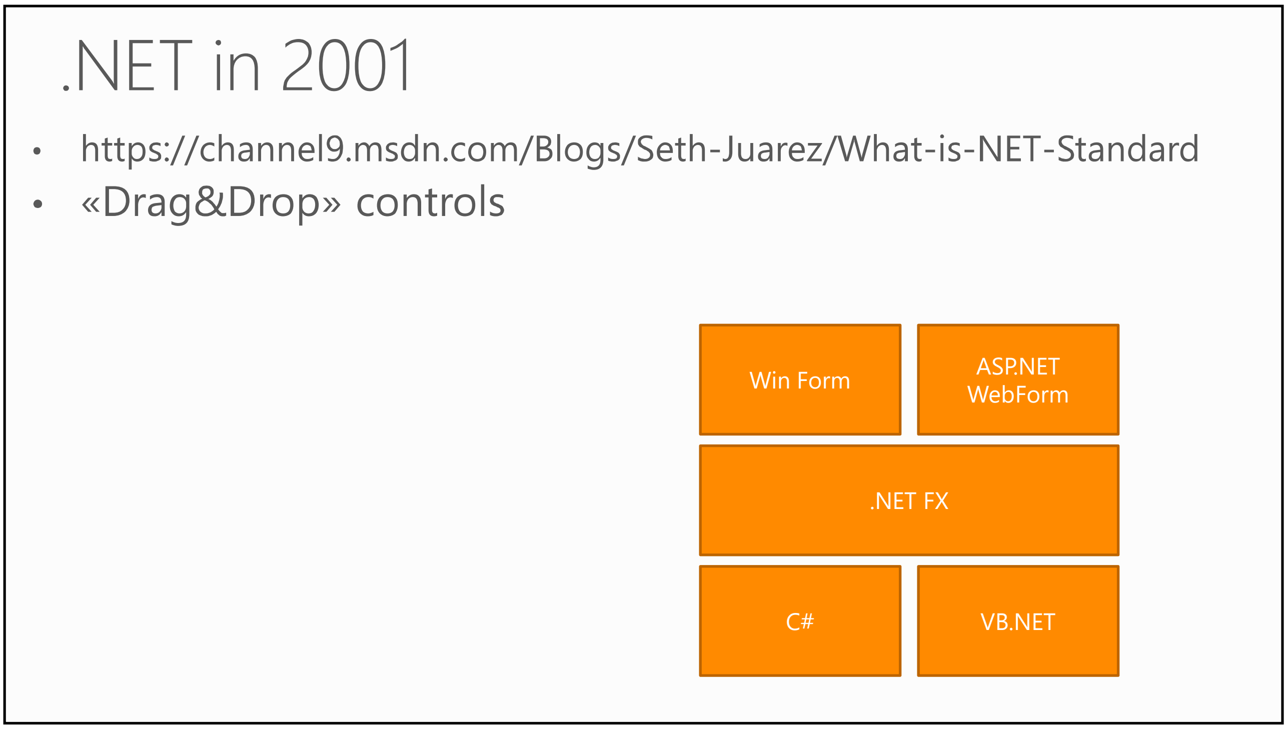


The year was 1996…

The need for a new Framework:

- COM3 and Visual Basic 6 needed a successor
  - COM/DCOM Problems
  - DLL Hell
  - C++ Code and Memory Management
- Java – Becoming Mightier Force (Seen as Enemy)
  - Runs Everywhere!!
  - JVM -> Jitted Execution Engine
- High cost per Mb
- Raising Internet, not Cloud
  - XML
- Fight for n°1 Cloud OS (Windows Vs. Linux)

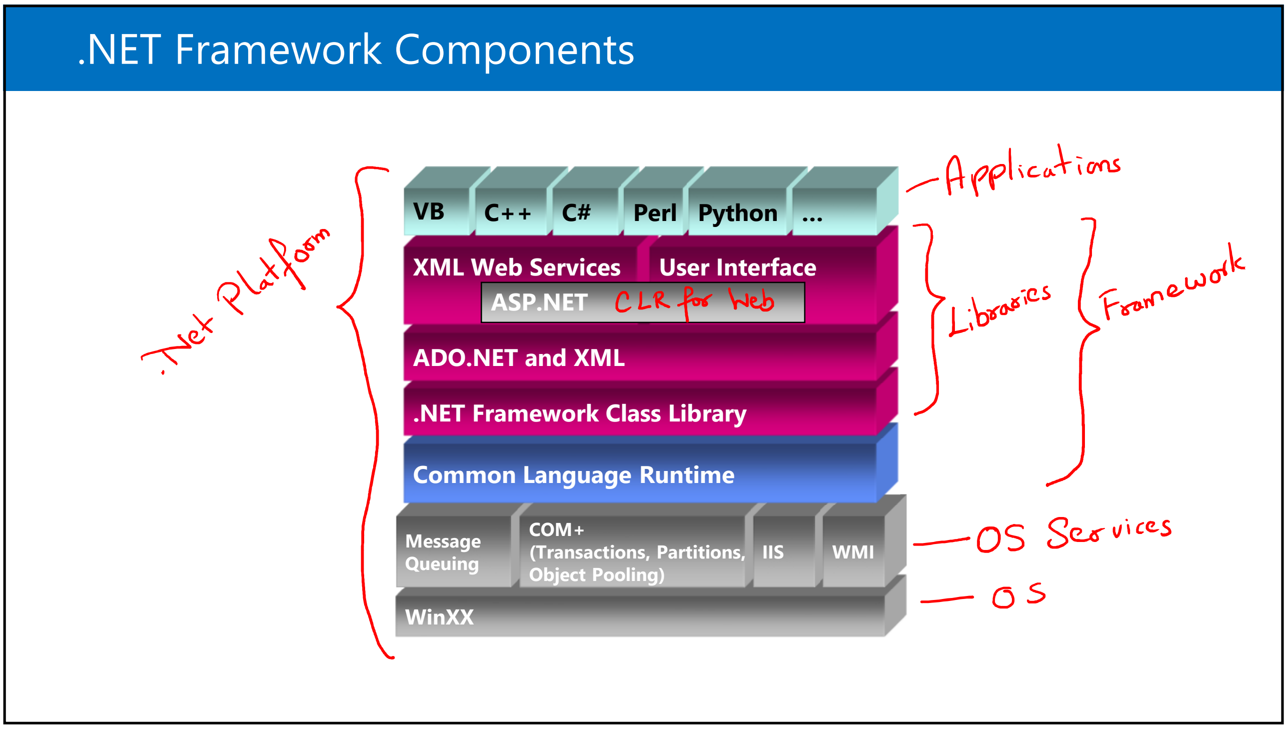
4



.NET in 2001

- https://channel9.msdn.com/Blogs/Seth-Juarez/What-is-NET-Standard
- «Drag&Drop» controls

5



.NET Framework Components

VB | C++ | C# | Perl | Python | …

XML Web Services | User Interface

ASP.NET

ADO.NET and XML

.NET Framework Class Library

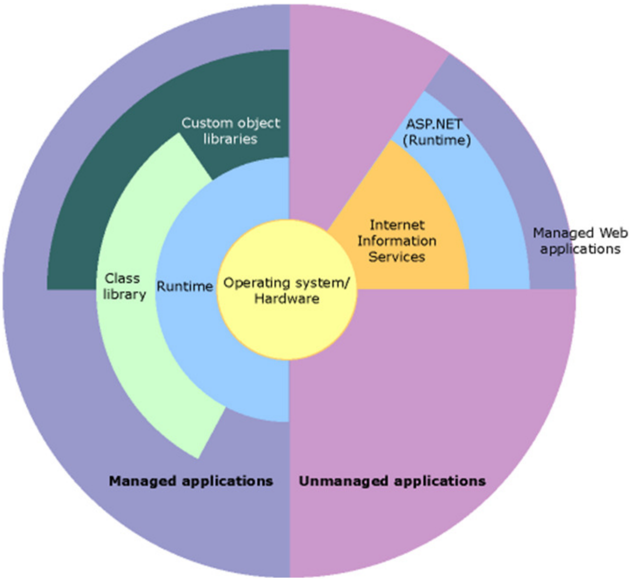
Common Language Runtime

Message Queuing | COM+ (Transactions, Partitions, Object Pooling) | IIS | WMI

WinXX

6

Managed Code Vs. Unmanaged Code



Custom object libraries

ASP.NET (Runtime)

Internet Information Services

Managed Web applications

Class library

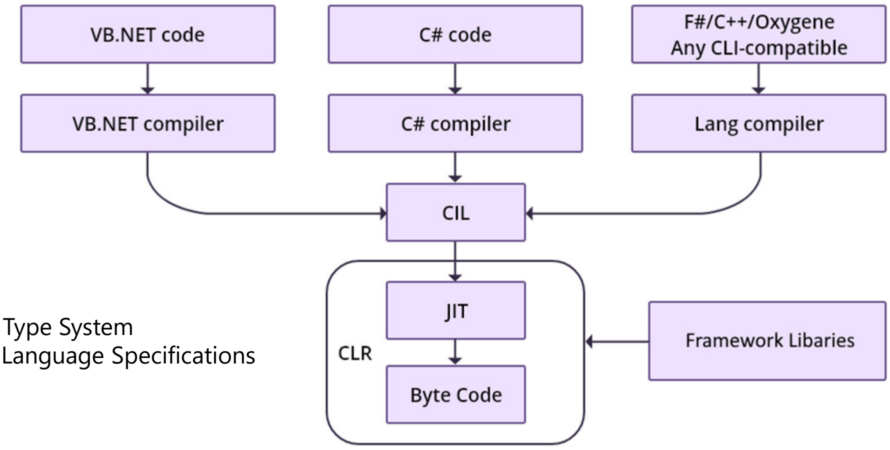
Runtime

Operating system/ Hardware

Managed applications

Unmanaged applications

How .NET Code Works



VB.NET code

C# code

F#/C++/Oxygene
Any CLI-compatible

VB.NET compiler

C# compiler

Lang compiler

CIL

CLR

JIT

Byte Code

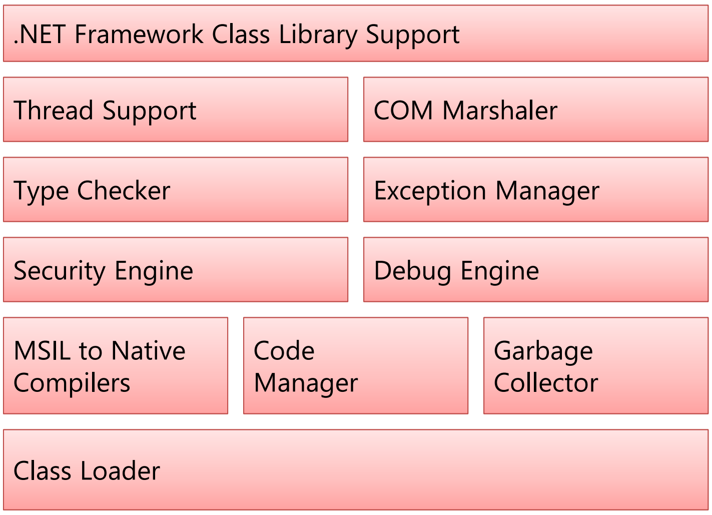
Framework Libaries

.net module
assemblies

CTS: Common Type System
CLS: Common Language Specifications

BENEFITS:
OS Independent
Architecture Independent
Device Independent
Development Tool Independent

CLR Components (Version 1.0 to 3.5)



.NET Framework Class Library Support

Thread Support

COM Marshaler

Type Checker

Exception Manager

Security Engine

Debug Engine

MSIL to Native Compilers

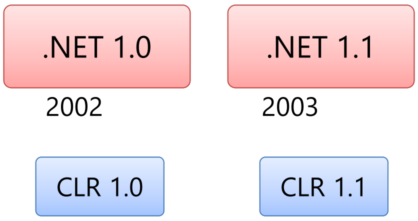
Code Manager

Garbage Collector

Class Loader

9

A Look Back…



.NET 1.0

2002

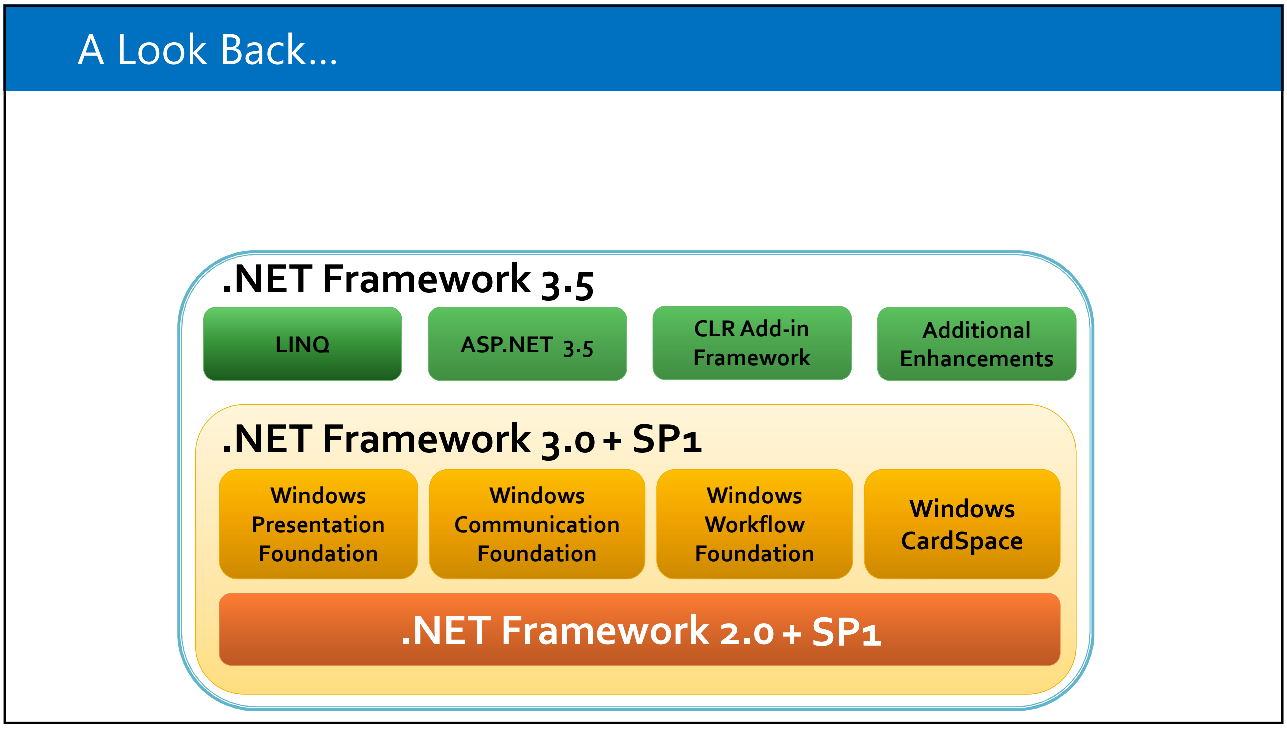
CLR 1.0

.NET 1.1

2003

CLR 1.1

10



A Look Back…

.NET Framework 3.5

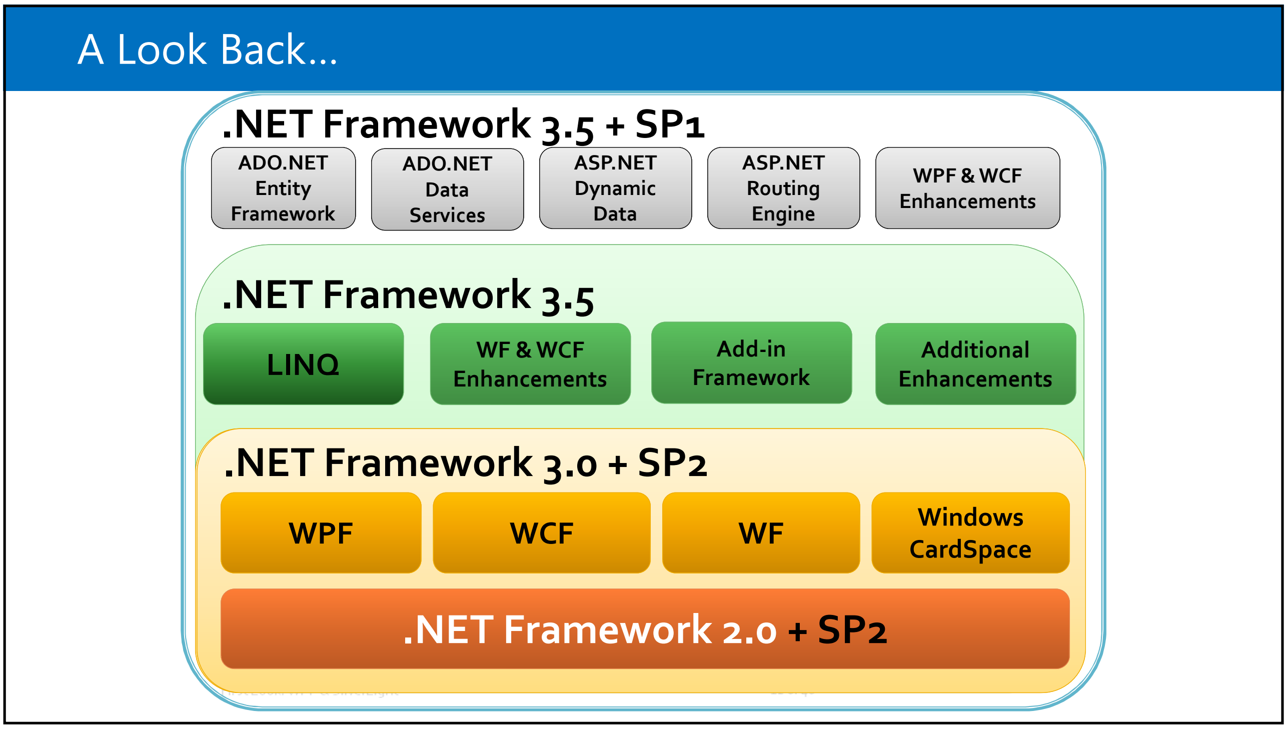
LINQ | ASP.NET 3.5 | CLR Add-in Framework | Additional Enhancements

.NET Framework 3.0 + SP1

Windows Presentation Foundation | Windows Communication Foundation | Windows Workflow Foundation | Windows CardSpace

.NET Framework 2.0 + SP1

11



A Look Back…

.NET Framework 3.5 + SP1

ADO.NET Entity Framework | ADO.NET Data Services | ASP.NET Dynamic Data | ASP.NET Routing Engine | WPF & WCF Enhancements

.NET Framework 3.5

LINQ | WF & WCF Enhancements | Add-in Framework | Additional Enhancements

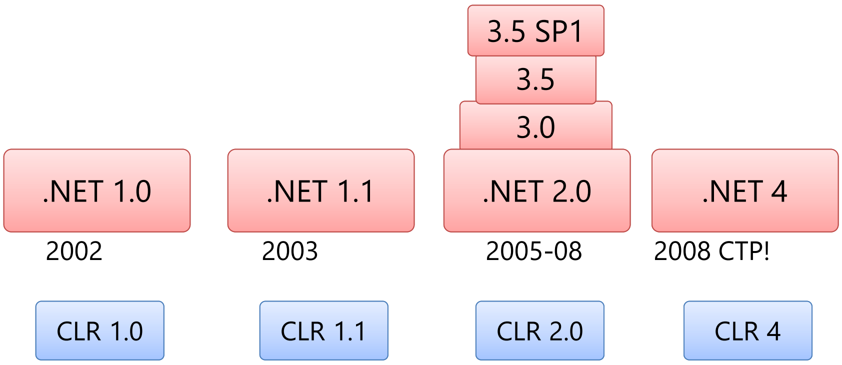
.NET Framework 3.0 + SP2

WPF | WCF | WF | Windows CardSpace

.NET Framework 2.0 + SP2

12

A Look Back…



3.5 SP1

3.5

3.0

.NET 1.0

2002

CLR 1.0

.NET 1.1

2003

CLR 1.1

.NET 2.0

2005-08

CLR 2.0

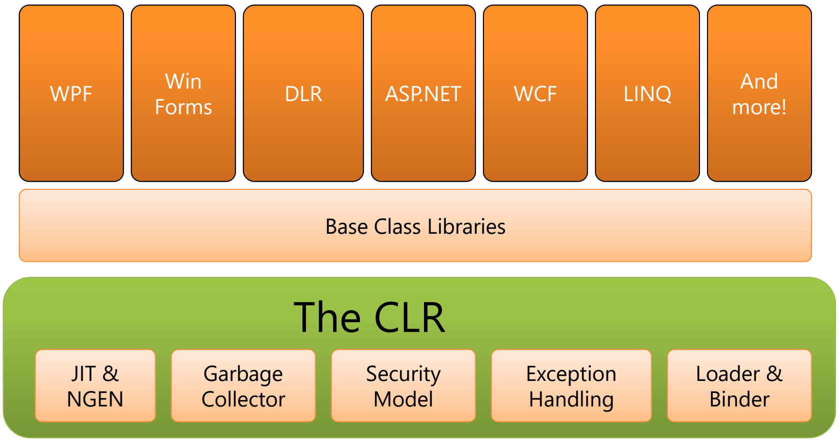
.NET 4

2008 CTP!

CLR 4

13

.NET Framework (Version 1.0 to 3.5)



WPF

Win Forms

DLR

ASP.NET

WCF

LINQ

And more!

Base Class Libraries

The CLR

JIT & NGEN

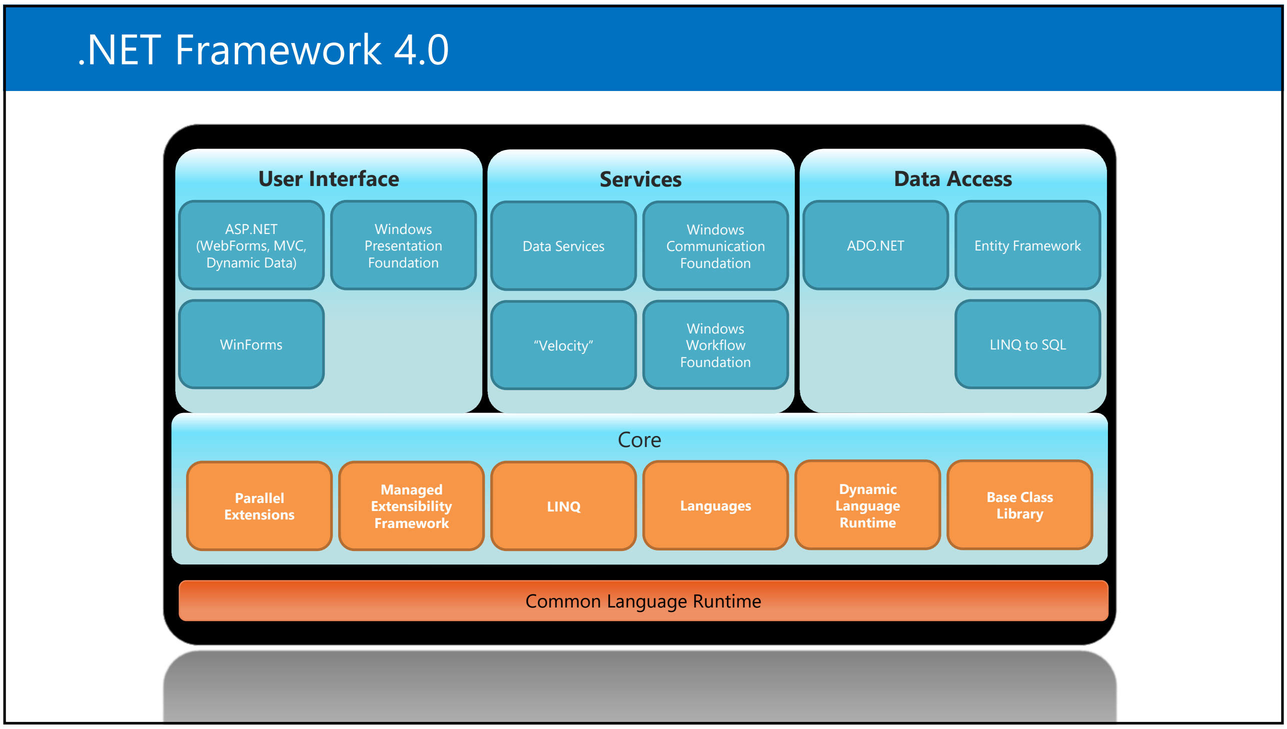
Garbage Collector

Security Model

Exception Handling

Loader & Binder

14



.NET Framework 4.0

User Interface

- ASP.NET (WebForms, MVC, Dynamic Data)
- Windows Presentation Foundation
- WinForms

Services

- Data Services
- Windows Communication Foundation
- "Velocity"
- Windows Workflow Foundation

Data Access

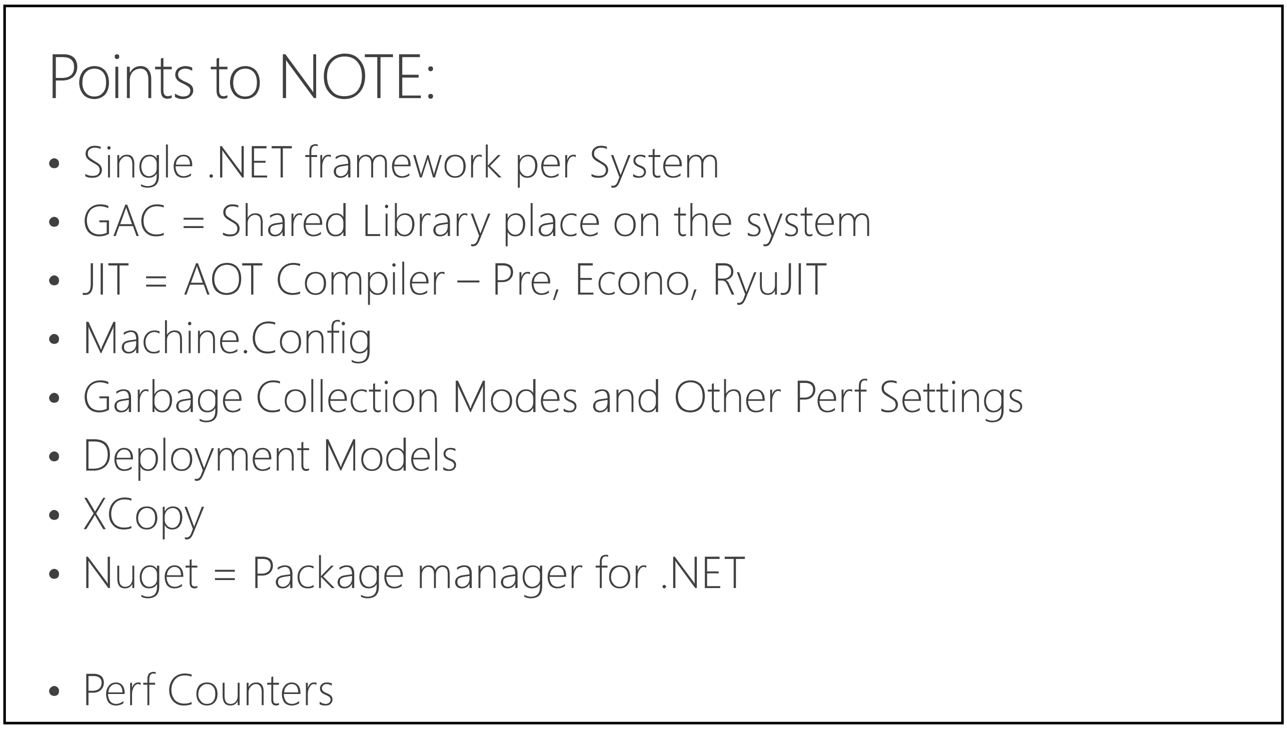
- ADO.NET
- Entity Framework
- LINQ to SQL

Core

- Parallel Extensions
- Managed Extensibility Framework
- LINQ
- Languages
- Dynamic Language Runtime
- Base Class Library

Common Language Runtime

15

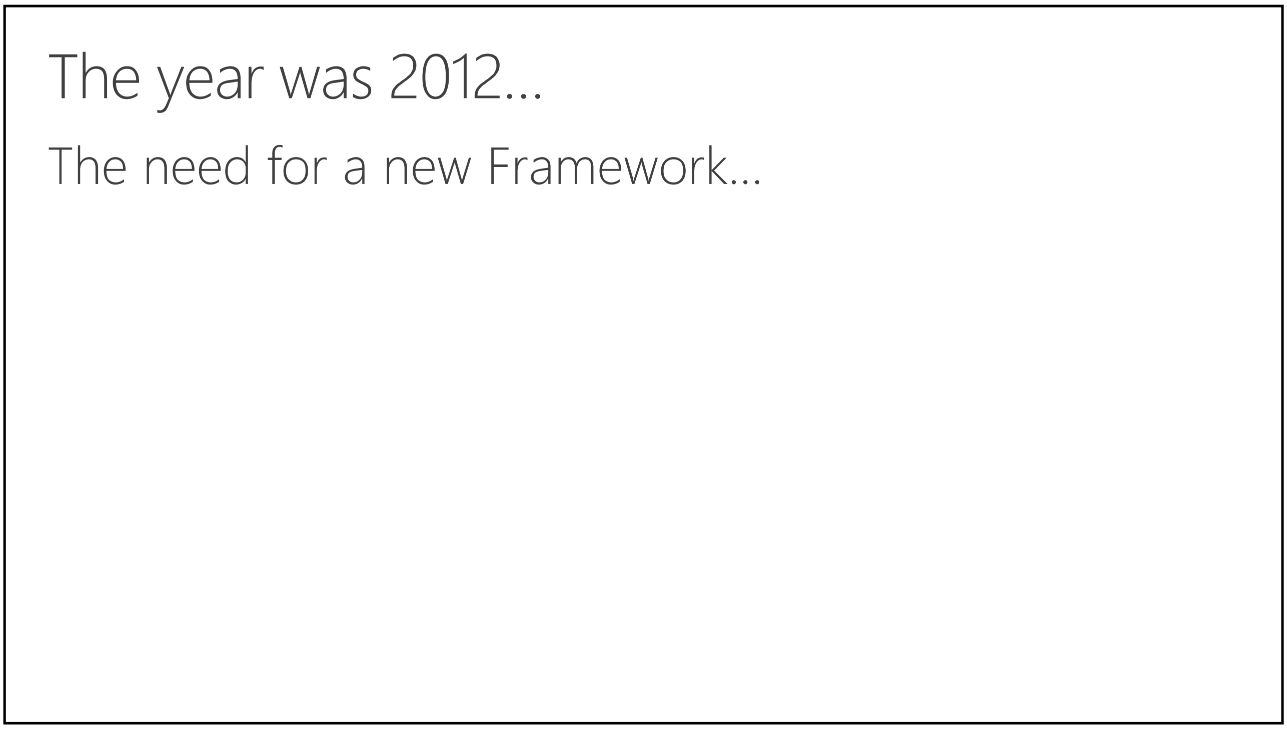


Points to NOTE:

- Single .NET framework per System
- GAC = Shared Library place on the system
- JIT = AOT Compiler – Pre, Econo, RyuJIT
- Machine.Config
- Garbage Collection Modes and Other Perf Settings
- Deployment Models
- XCopy
- Nuget = Package manager for .NET

- Perf Counters

16



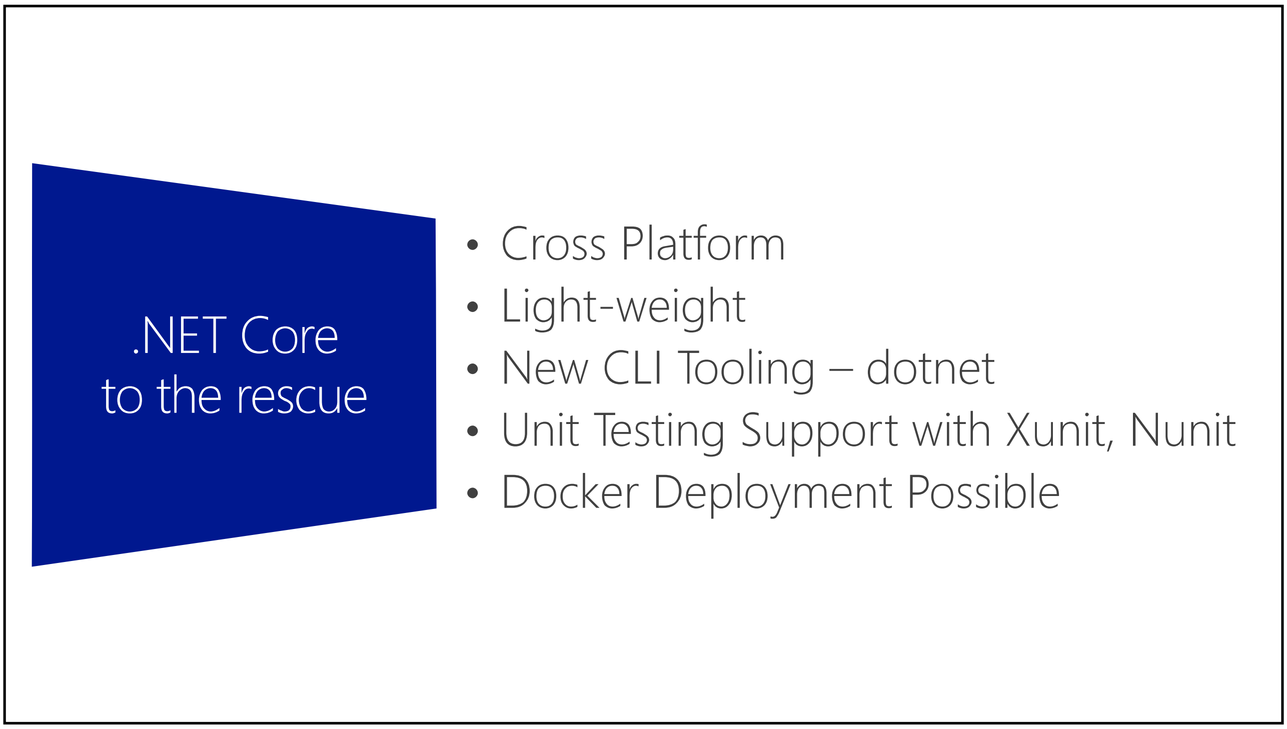
The year was 2012...

The need for a new Framework...

17

.NET CORE

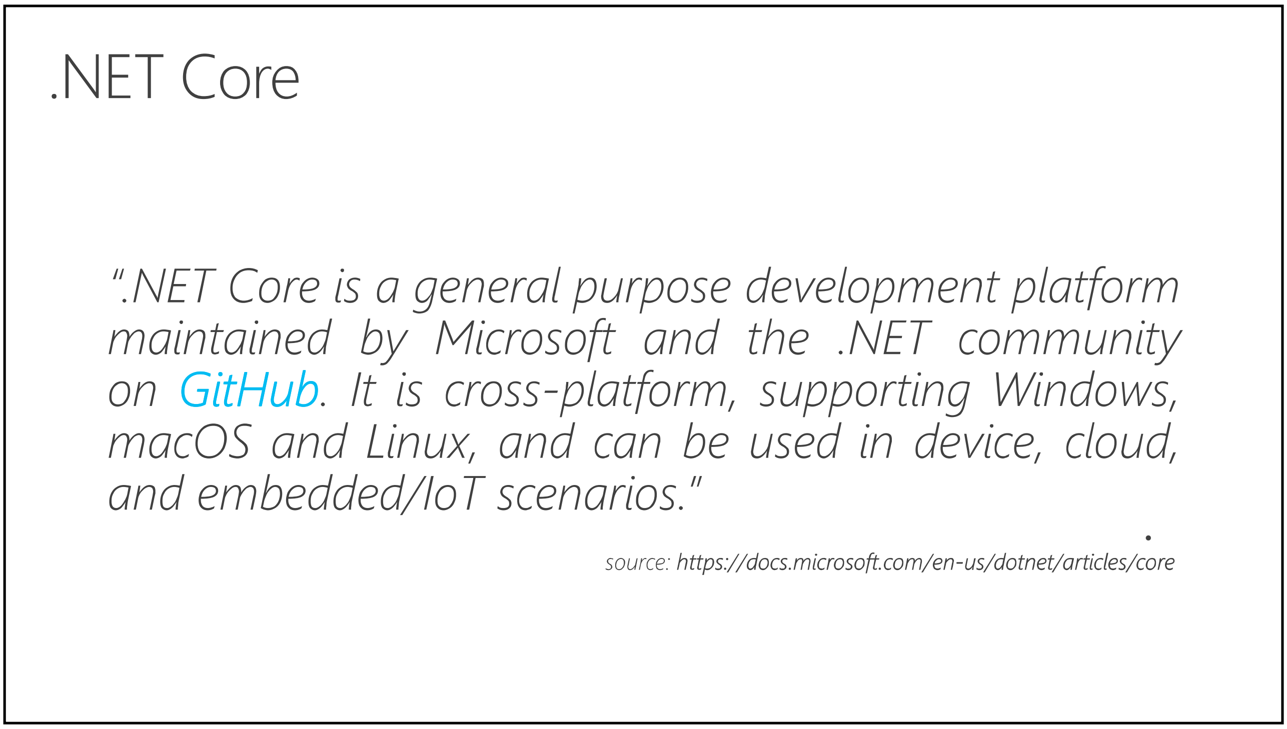
18



.NET Core to the rescue

- Cross Platform
- Light-weight
- New CLI Tooling – dotnet
- Unit Testing Support with Xunit, Nunit
- Docker Deployment Possible

19



.NET Core

> *".NET Core is a general purpose development platform maintained by Microsoft and the .NET community on GitHub. It is cross-platform, supporting Windows, macOS and Linux, and can be used in device, cloud, and embedded/IoT scenarios."*

source: *https://docs.microsoft.com/en-us/dotnet/articles/core*

20

What is .NET Core

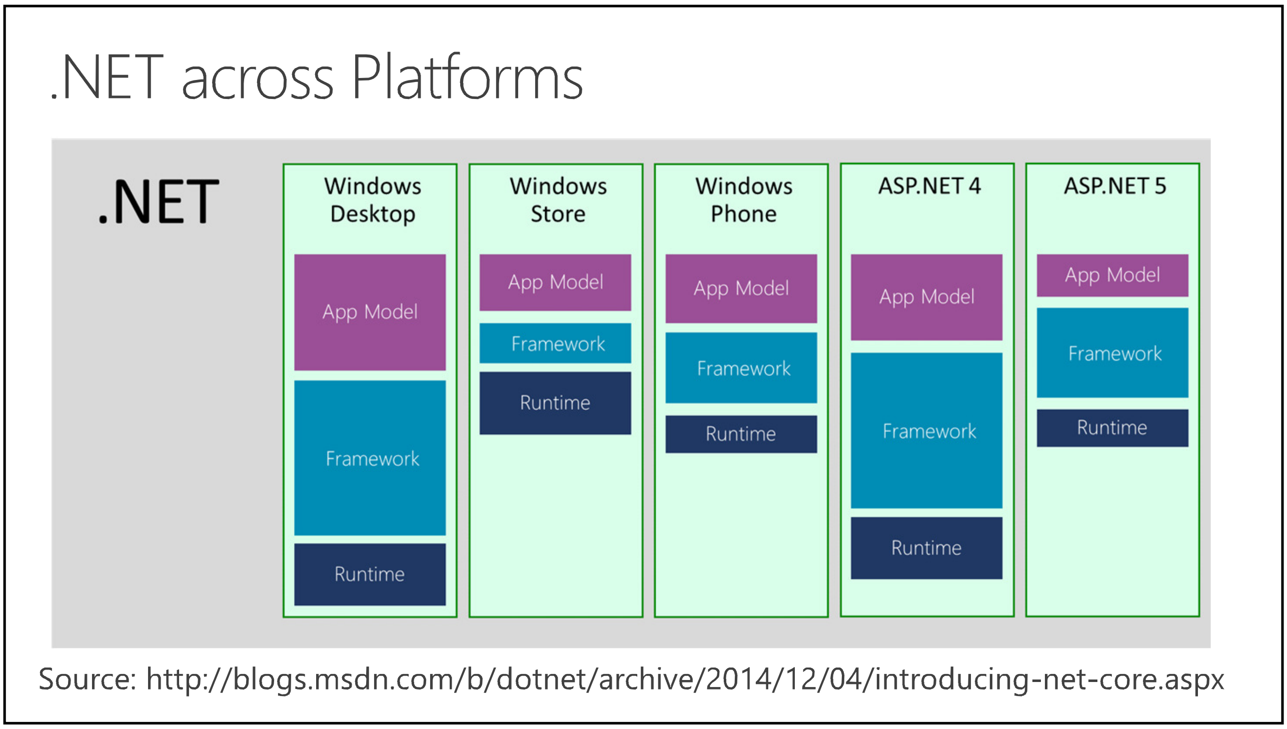
- **Flexible deployment:** Can be included in your app or installed side-by-side user- or machine-wide.
- **Cross-platform:** Runs on Windows, macOS and Linux; can be ported to other OSes. The supported Operating Systems (OS), CPUs and application scenarios will grow over time, provided by Microsoft, other companies, and individuals.
- **Command-line tools:** All product scenarios can be exercised at the command-line.

21

What is .NET Core

- **Compatible:** .NET Core is compatible with .NET Framework, Xamarin and Mono, via the **.NET Standard Library**.
- **Open source:** The .NET Core platform is open source, using MIT and Apache 2 licenses. Documentation is licensed under CC-BY.
  .NET Core is a **.NET Foundation project**.
- **Supported by Microsoft:** .NET Core is supported by Microsoft, per .NET Core Support

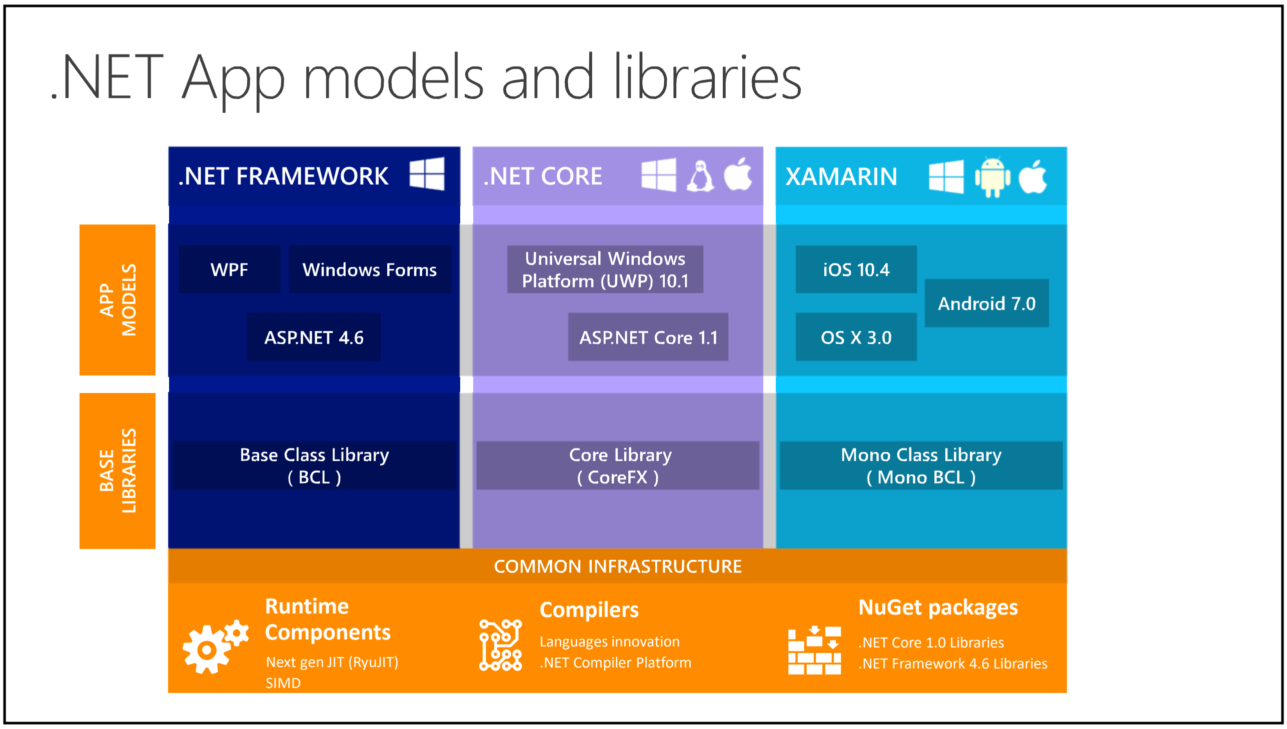
22



.NET across Platforms

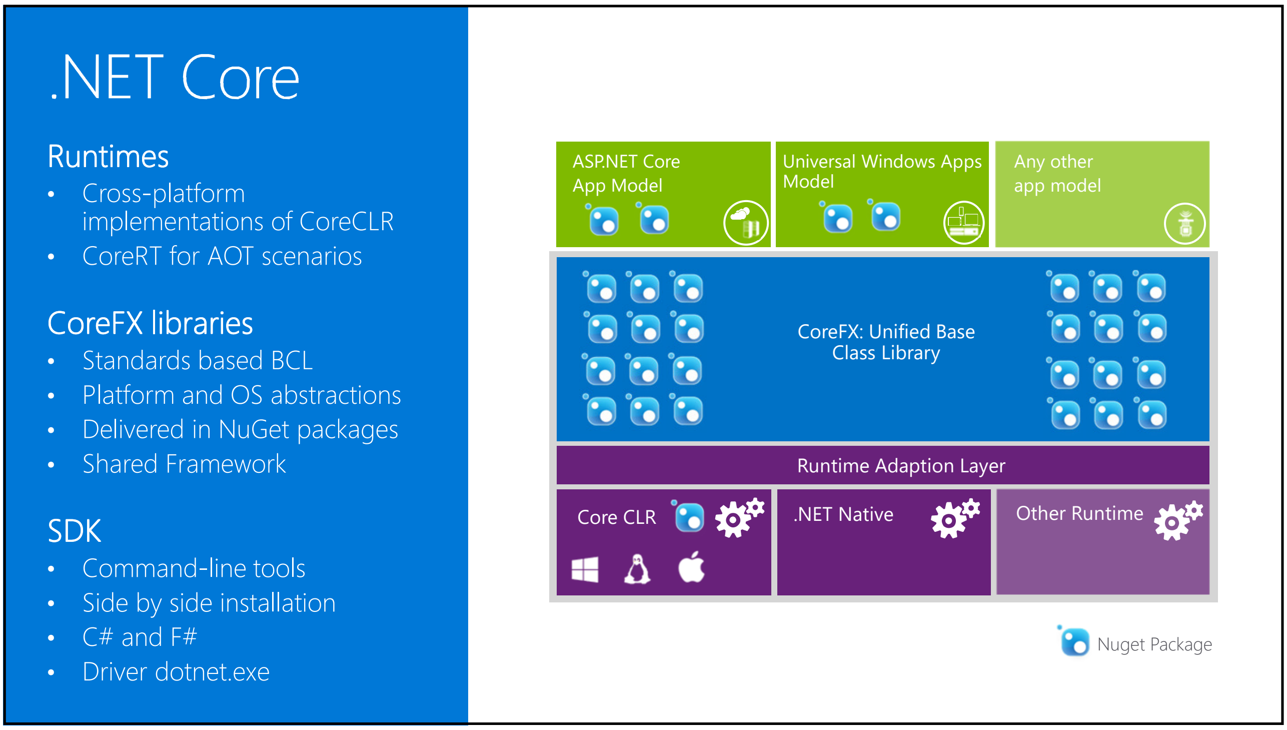
Source: http://blogs.msdn.com/b/dotnet/archive/2014/12/04/introducing-net-core.aspx

23



.NET App models and libraries

24



.NET Core

Runtimes

- Cross-platform implementations of CoreCLR
- CoreRT for AOT scenarios

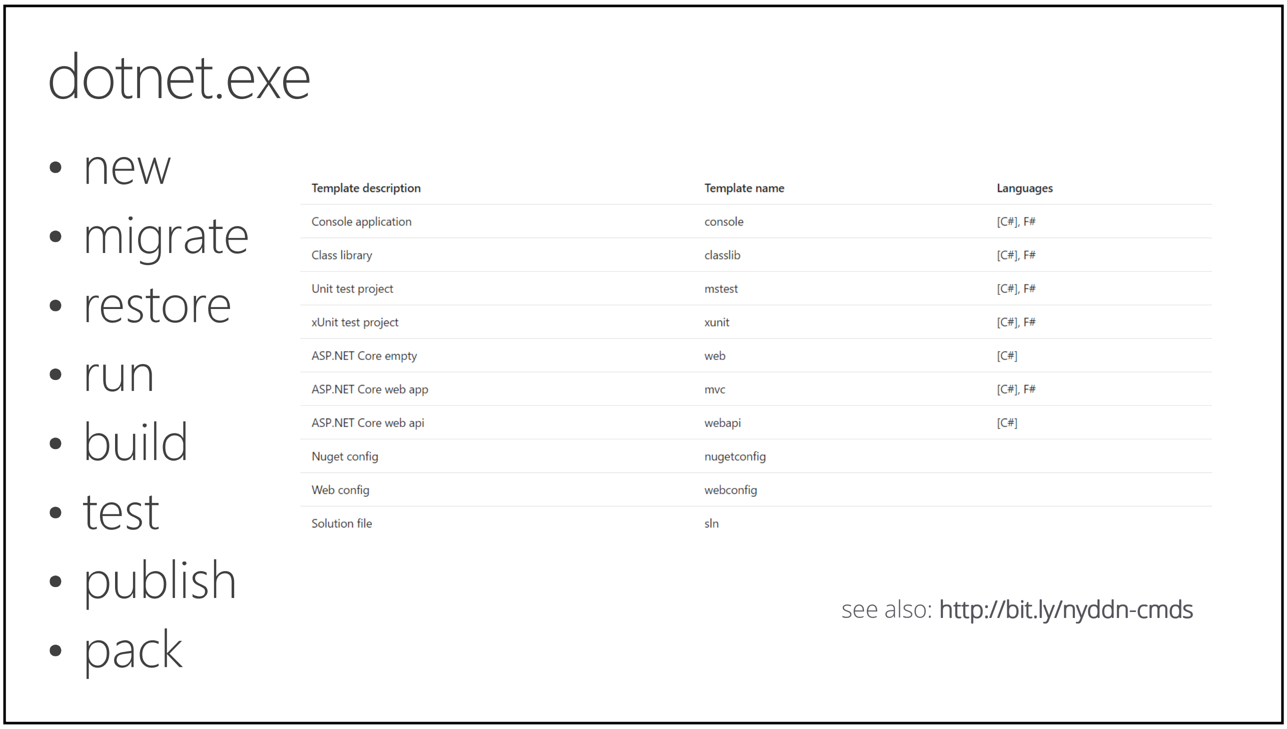
CoreFX libraries

- Standards based BCL
- Platform and OS abstractions
- Delivered in NuGet packages
- Shared Framework

SDK

- Command-line tools
- Side by side installation
- C# and F#
- Driver dotnet.exe

25



dotnet.exe

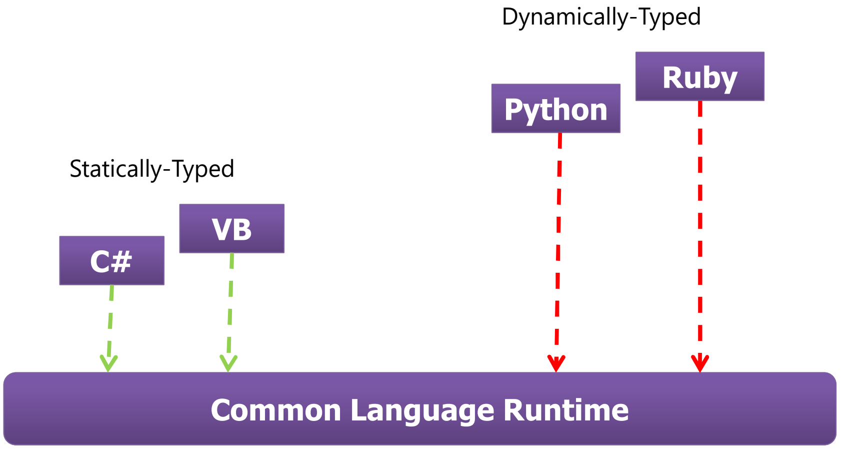
- new
- migrate
- restore
- run
- build
- test
- publish
- pack

Template description	Template name	Languages
Console application	console	[C#], F#
Class library	classlib	[C#], F#
Unit test project	mstest	[C#], F#
xUnit test project	xunit	[C#], F#
ASP.NET Core empty	web	[C#]
ASP.NET Core web app	mvc	[C#], F#
ASP.NET Core web api	webapi	[C#]
Nuget config	nugetconfig	
Web config	webconfig	
Solution file	sln	

see also: http://bit.ly/nyddn-cmds

26

Need for "Dynamic Language Runtime"



Dynamically-Typed

Python

Ruby

Statically-Typed

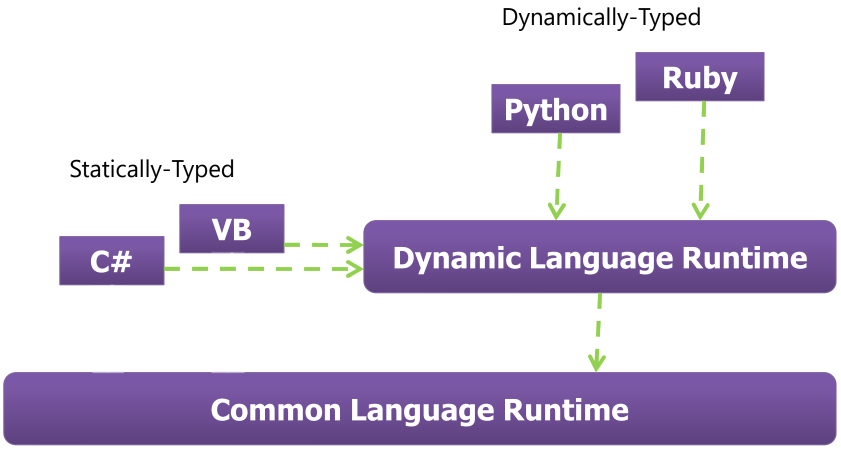
C#

VB

Common Language Runtime

27

Dynamic Language Runtime (DLR)



Dynamically-Typed

Python

Ruby

Statically-Typed

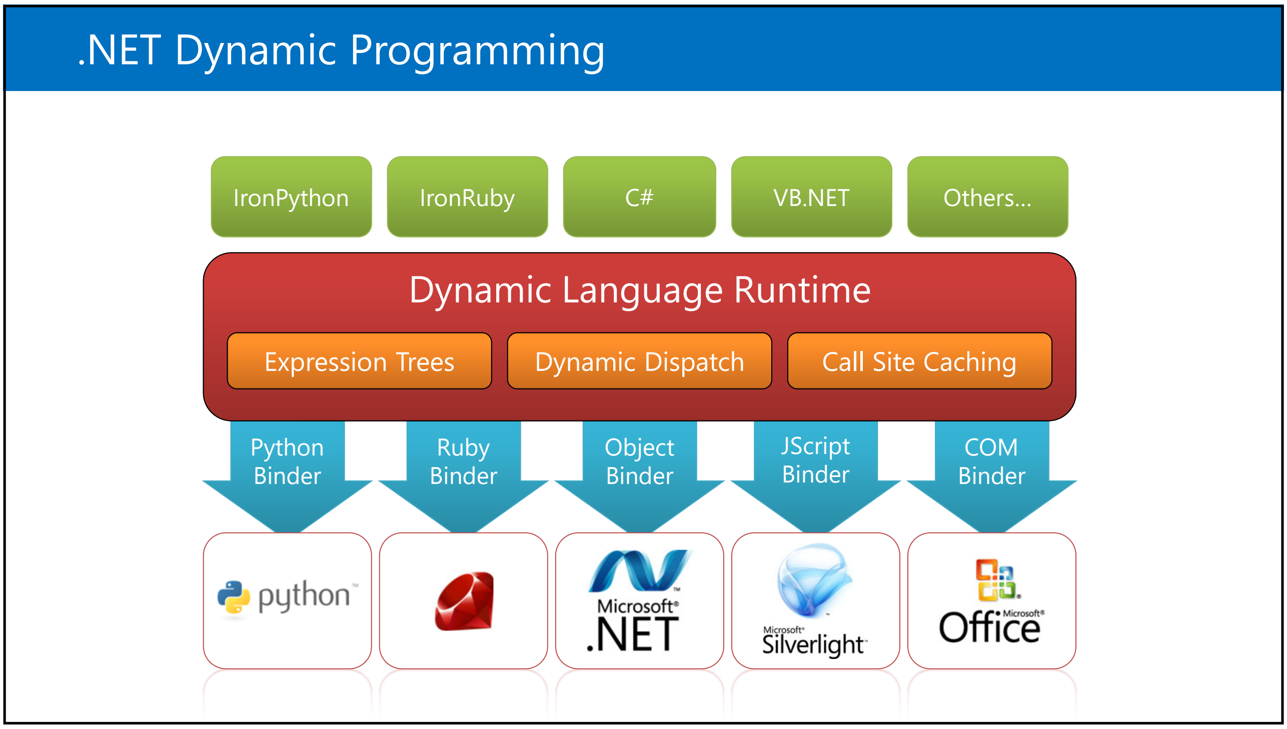
C#

VB

Dynamic Language Runtime

Common Language Runtime

28



.NET Dynamic Programming

IronPython

IronRuby

C#

VB.NET

Others…

Dynamic Language Runtime

Expression Trees

Dynamic Dispatch

Call Site Caching

Python Binder

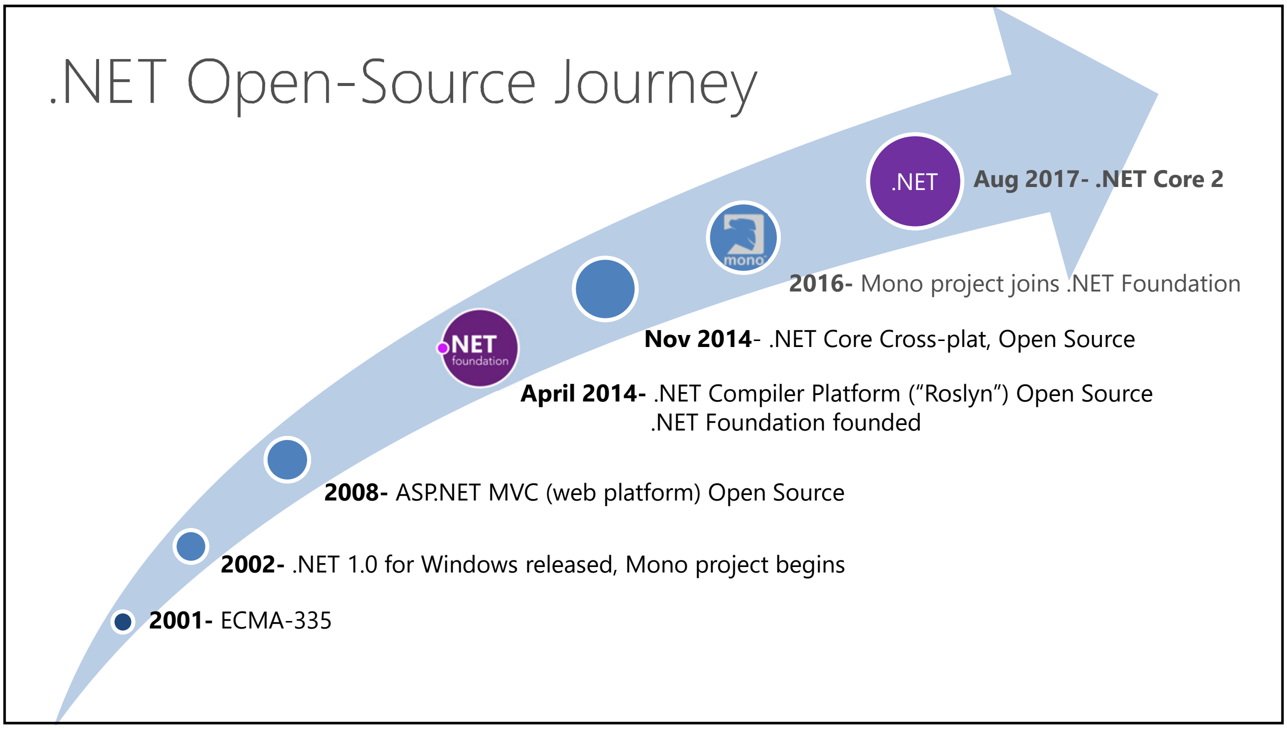
Ruby Binder

Object Binder

JScript Binder

COM Binder

29



.NET Open-Source Journey

Aug 2017- **.NET Core 2**

2016- Mono project joins .NET Foundation

Nov 2014- .NET Core Cross-plat, Open Source

April 2014- .NET Compiler Platform (“Roslyn”) Open Source
.NET Foundation founded

2008- ASP.NET MVC (web platform) Open Source

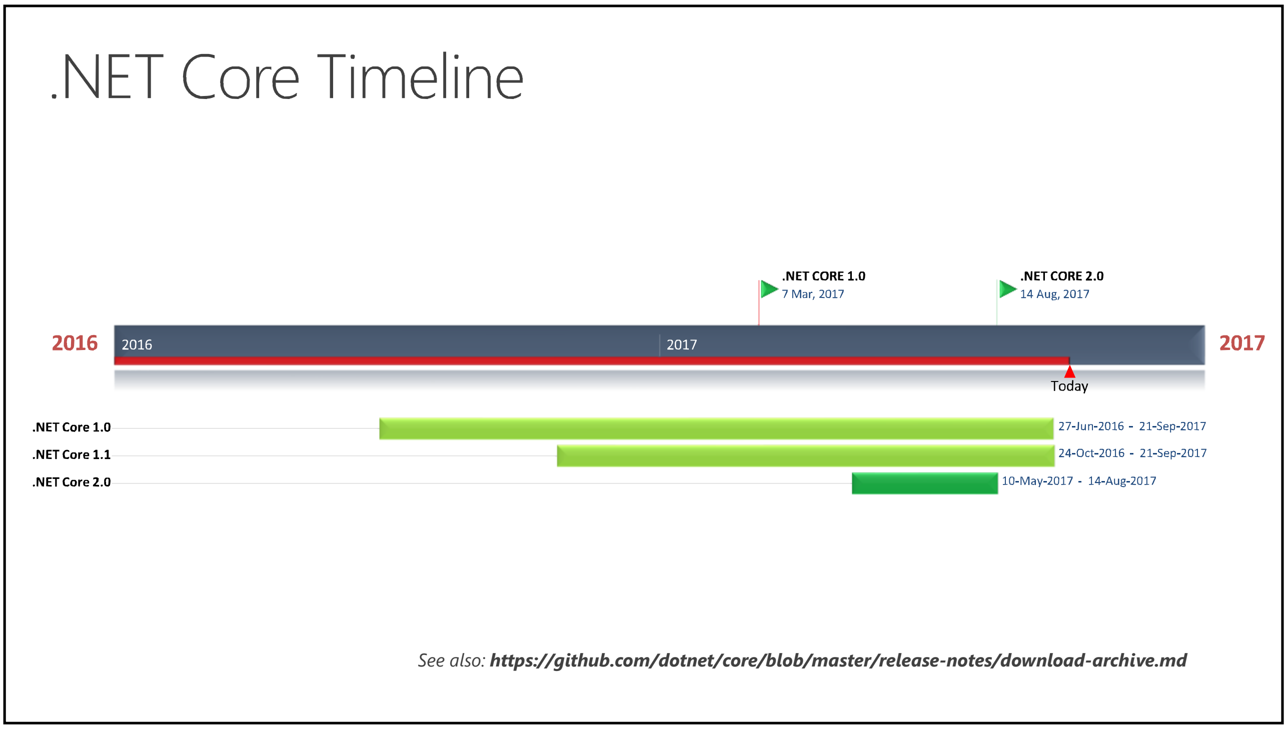
2002- .NET 1.0 for Windows released, Mono project begins

2001- ECMA-335

30

.NET today

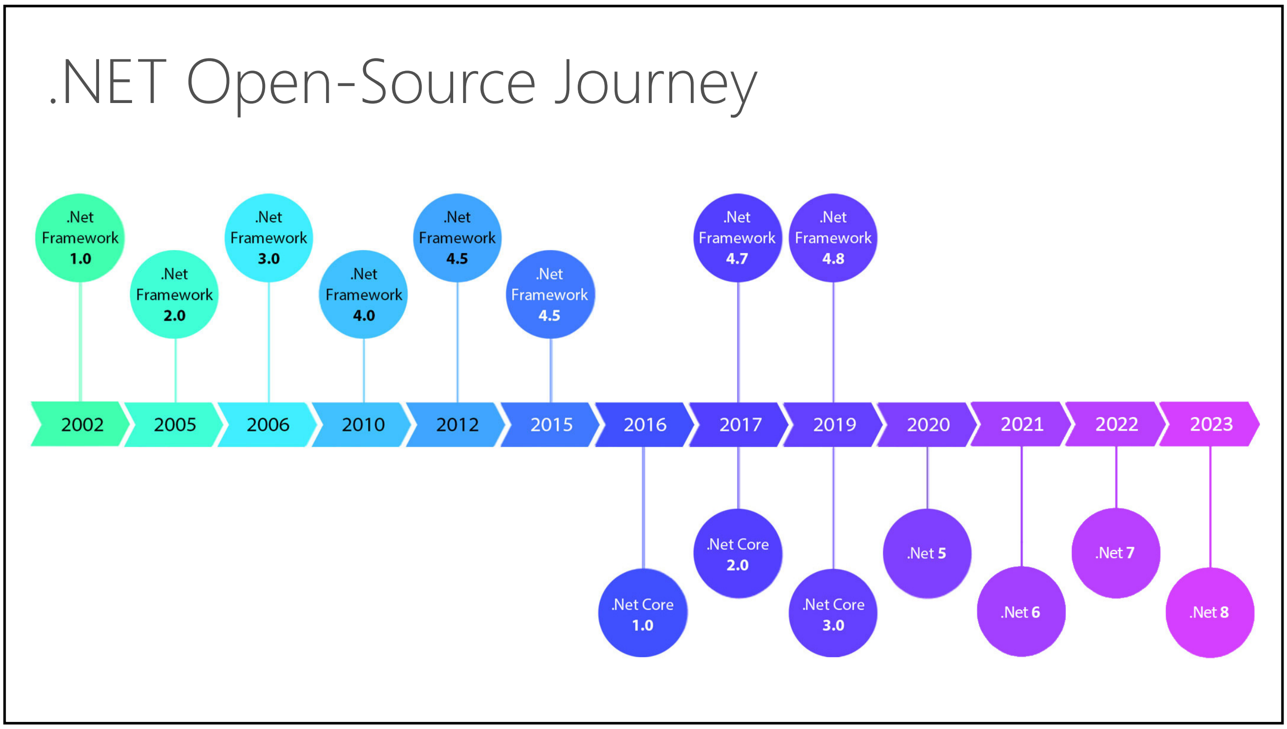
31



.NET Core Timeline

See also: ***https://github.com/dotnet/core/blob/master/release-notes/download-archive.md***

32



.NET Open-Source Journey

.Net Framework **1.0** — 2002

.Net Framework **2.0** — 2005

.Net Framework **3.0** — 2006

.Net Framework **4.0** — 2010

.Net Framework **4.5** — 2012

.Net Framework **4.5** — 2015

.Net Core **1.0** — 2016

.Net Framework **4.7** — 2017

.Net Core **2.0** — 2017

.Net Framework **4.8** — 2019

.Net Core **3.0** — 2019

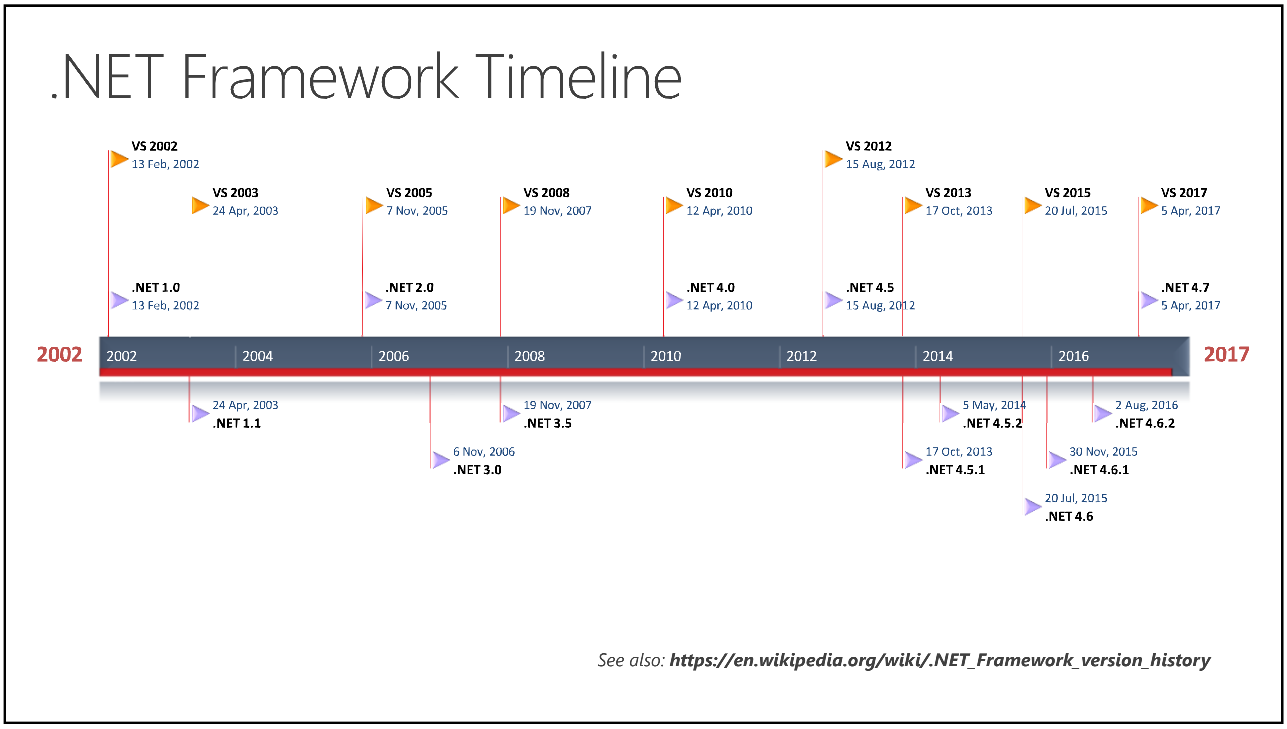
.Net **5** — 2020

.Net **6** — 2021

.Net **7** — 2022

.Net **8** — 2023

33



.NET Framework Timeline

VS 2002 13 Feb, 2002

VS 2003 24 Apr, 2003

VS 2005 7 Nov, 2005

VS 2008 19 Nov, 2007

VS 2010 12 Apr, 2010

VS 2012 15 Aug, 2012

VS 2013 17 Oct, 2013

VS 2015 20 Jul, 2015

VS 2017 5 Apr, 2017

.NET 1.0 13 Feb, 2002

.NET 2.0 7 Nov, 2005

.NET 4.0 12 Apr, 2010

.NET 4.5 15 Aug, 2012

.NET 4.7 5 Apr, 2017

24 Apr, 2003 **.NET 1.1**

6 Nov, 2006 **.NET 3.0**

19 Nov, 2007 **.NET 3.5**

17 Oct, 2013 **.NET 4.5.1**

5 May, 2014 **.NET 4.5.2**

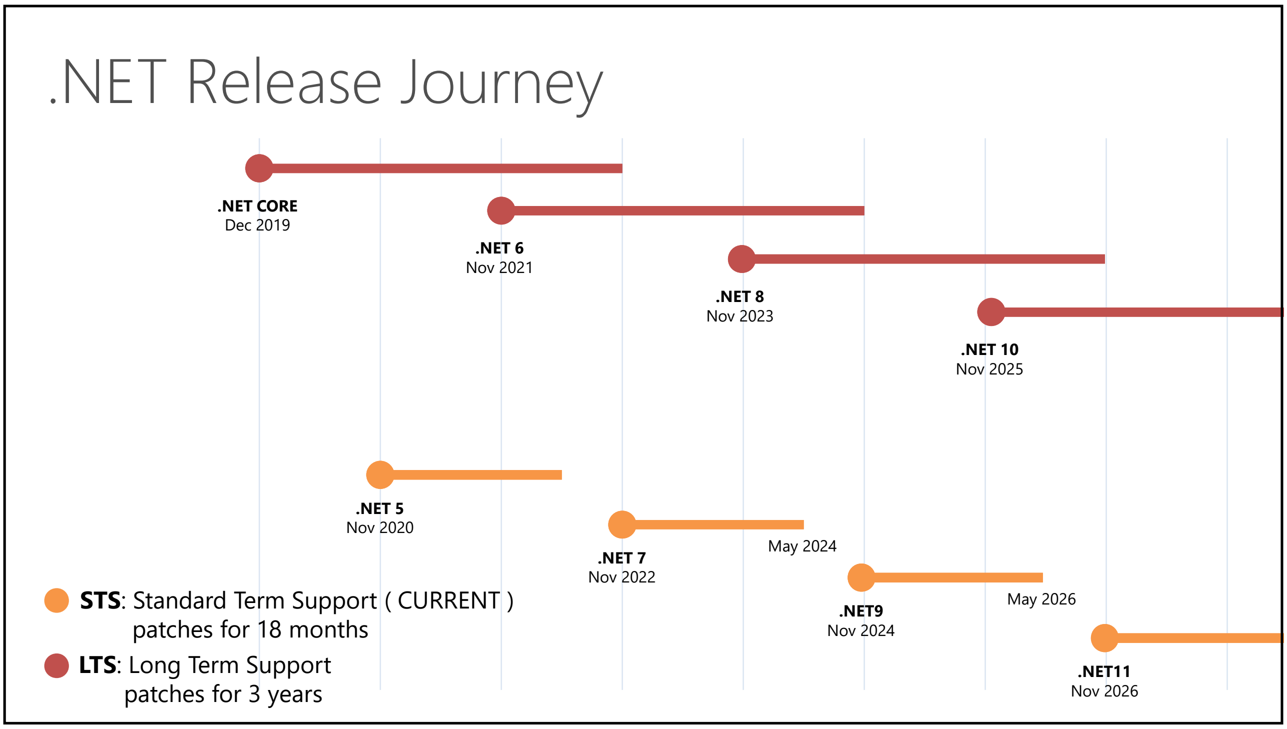
20 Jul, 2015 **.NET 4.6**

30 Nov, 2015 **.NET 4.6.1**

2 Aug, 2016 **.NET 4.6.2**

See also: ***https://en.wikipedia.org/wiki/.NET_Framework_version_history***

34



.NET Release Journey

.NET CORE
Dec 2019

.NET 6
Nov 2021

.NET 8
Nov 2023

.NET 10
Nov 2025

.NET 5
Nov 2020

.NET 7
Nov 2022

May 2024

.NET9
Nov 2024

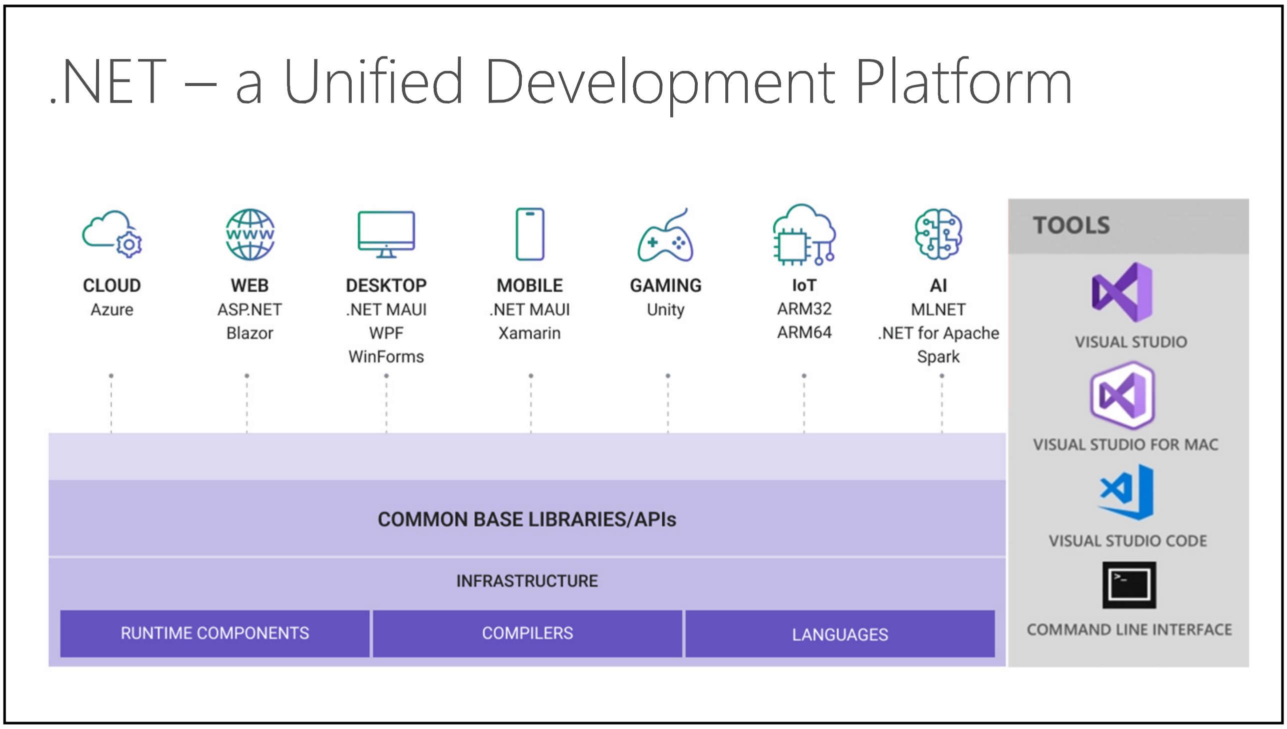
May 2026

.NET11
Nov 2026

● **STS**: Standard Term Support (CURRENT)
patches for 18 months

● **LTS**: Long Term Support
patches for 3 years

35



.NET – a Unified Development Platform

CLOUD
Azure

WEB
ASP.NET
Blazor

DESKTOP
.NET MAUI
WPF
WinForms

MOBILE
.NET MAUI
Xamarin

GAMING
Unity

IoT
ARM32
ARM64

AI
MLNET
.NET for Apache Spark

COMMON BASE LIBRARIES/APIs

INFRASTRUCTURE

RUNTIME COMPONENTS | COMPILERS | LANGUAGES

TOOLS

VISUAL STUDIO

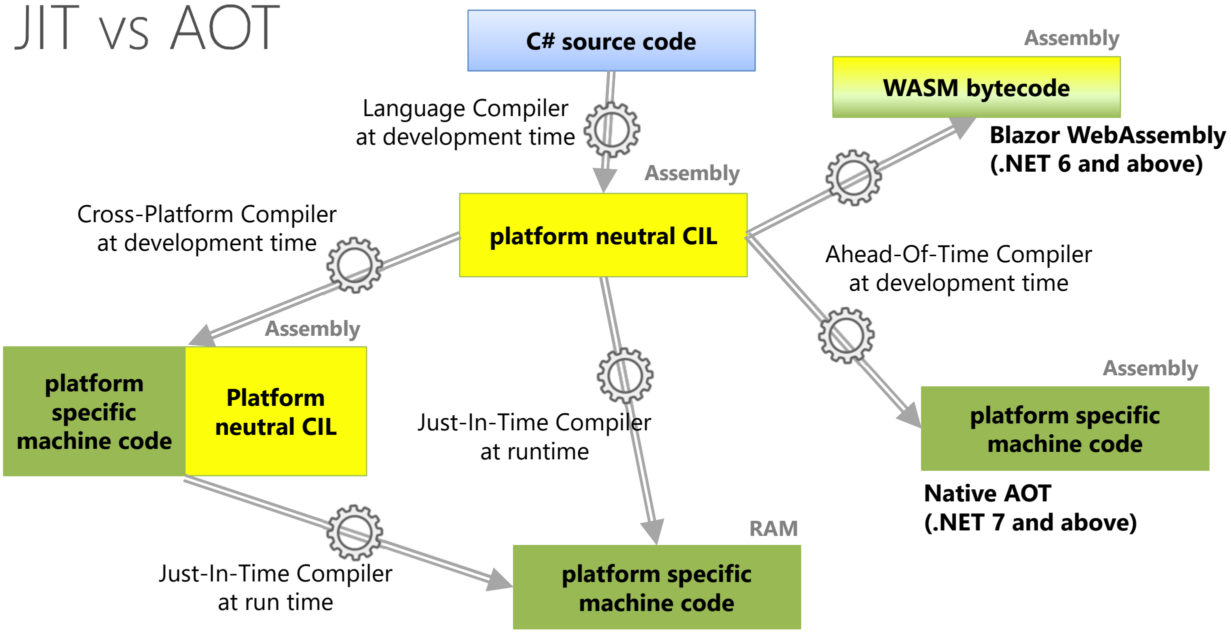
VISUAL STUDIO FOR MAC

VISUAL STUDIO CODE

COMMAND LINE INTERFACE

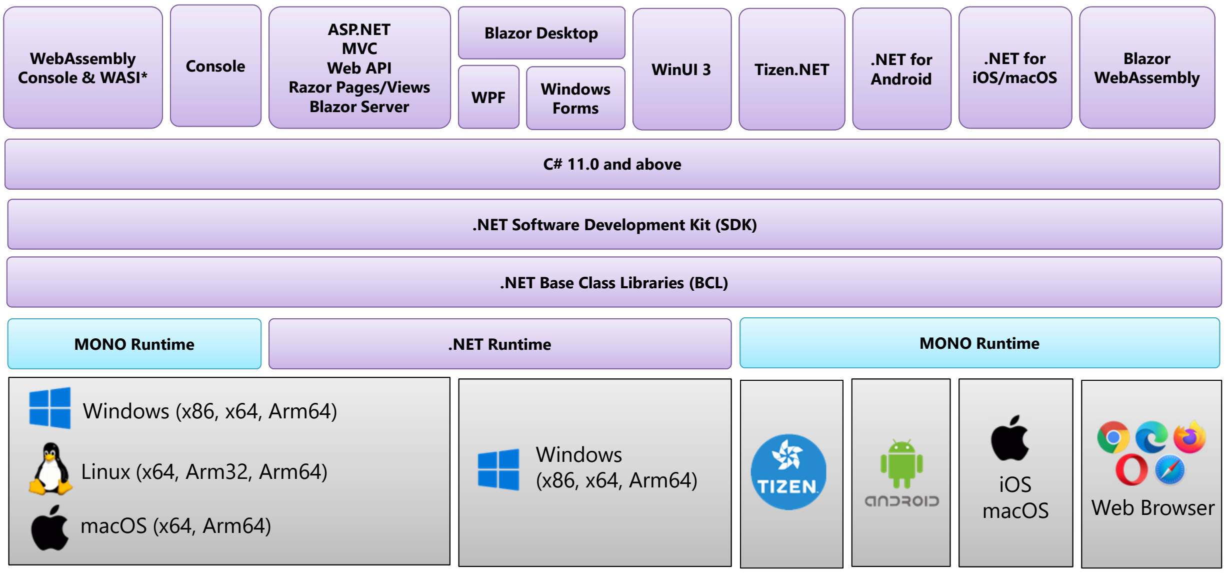
36

JIT vs AOT



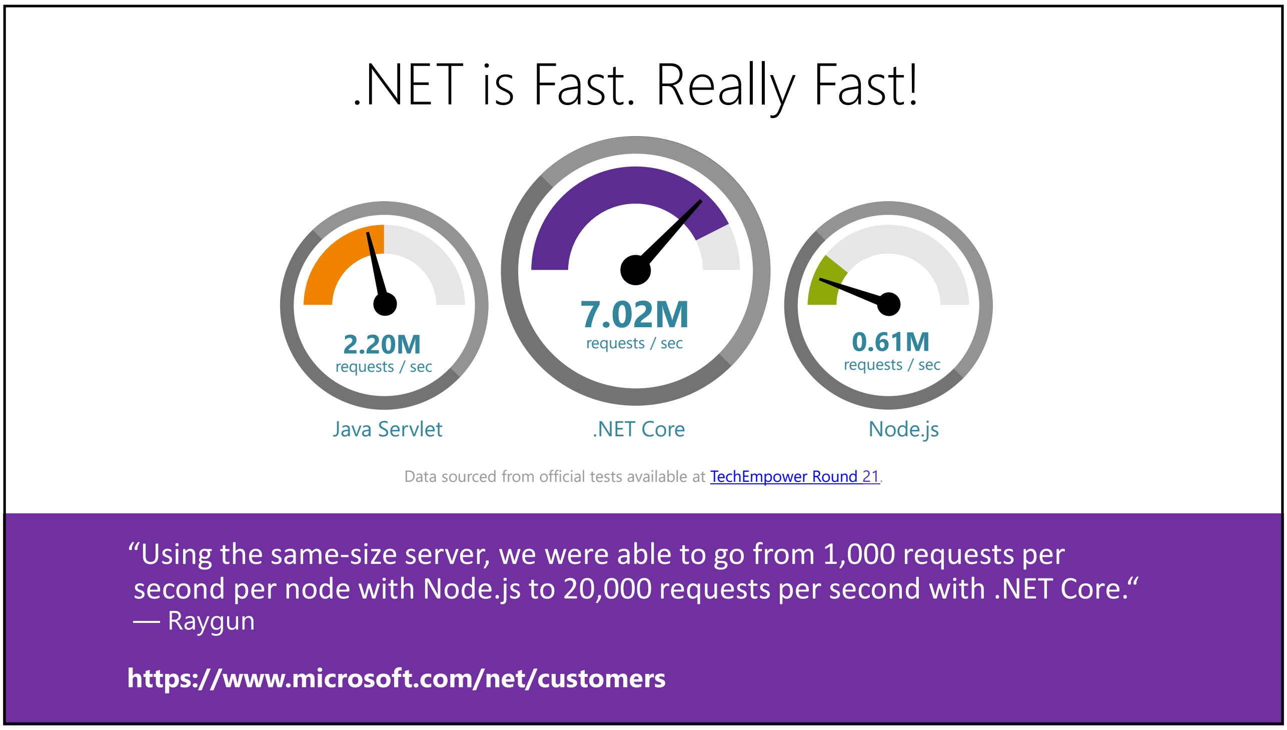
37

Application Types (.NET 7 and above)



*WASI (WebAssembly System Interface)

38



.NET is Fast. Really Fast!

2.20M
requests / sec
Java Servlet

7.02M
requests / sec
.NET Core

0.61M
requests / sec
Node.js

Data sourced from official tests available at TechEmpower Round 21.

"Using the same-size server, we were able to go from 1,000 requests per second per node with Node.js to 20,000 requests per second with .NET Core."
— Raygun

https://www.microsoft.com/net/customers

39

C#

40

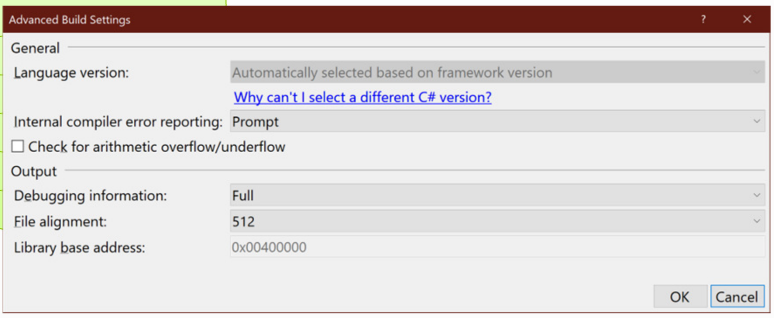
C# Language

C#1		Jan 2002	FW 1.0
C#2	Generics, Nullables, Iterators	Nov 2005	FW 2.0
C#3	LINQ	Nov 2007	FW 3.5
C#4	Dynamic	Apr 2010	FW 4.0
C#5	Async/await	Aug 2012	FW 4.5
C#6	Roslyn, String Interpolation, Property Initializers	Jul 2015	FW 4.6 / Core 1.0
C# 7	Out, Tuples, Pattern Matching, Local Functions	Mar 2017	FW 4.7
C# 8	.NET CORE, Readonly, Null-coalescing, Ranges	Sep 2019	Core 3.0
C# 9	.NET 5, Top Level Statements, Record	Nov 2020	.NET 5
C# 10	Global Using, Const Interpolation, Record struct	Nov 2021	.NET 6
C# 11	Generic Math, Raw String Literals, UTF8	Nov 2022	.NET 7
C# 12	Primary Constructors, Collection Expressions	Nov 2023	.NET 8
C# 13	Improved Params & Thread Synchronization	Nov 2024	.NET 9
C# 14		Nov 2025	.NET 10

Default Language Version

Target framework	Version	Default C# language version
.NET 9	9.0	**C# 13.0**
.NET 8 (LTS)	8.0	C# 12.0
.NET 7	7.0	C# 11.0
.NET 6 (LTS)	6.0	C# 10.0
.NET 5	5.0	C# 9.0
.NET Core	3.x	
.NET Core	2.x	
.NET Standard	2.1	
.NET Standard	2.0	
.NET Standard	1.x	
.NET Framework	all	

The Compiler determines the DEFAULT Language Version.



General

Language version: Automatically selected based on framework version

Why can't I select a different C# version?

Internal compiler error reporting: Prompt

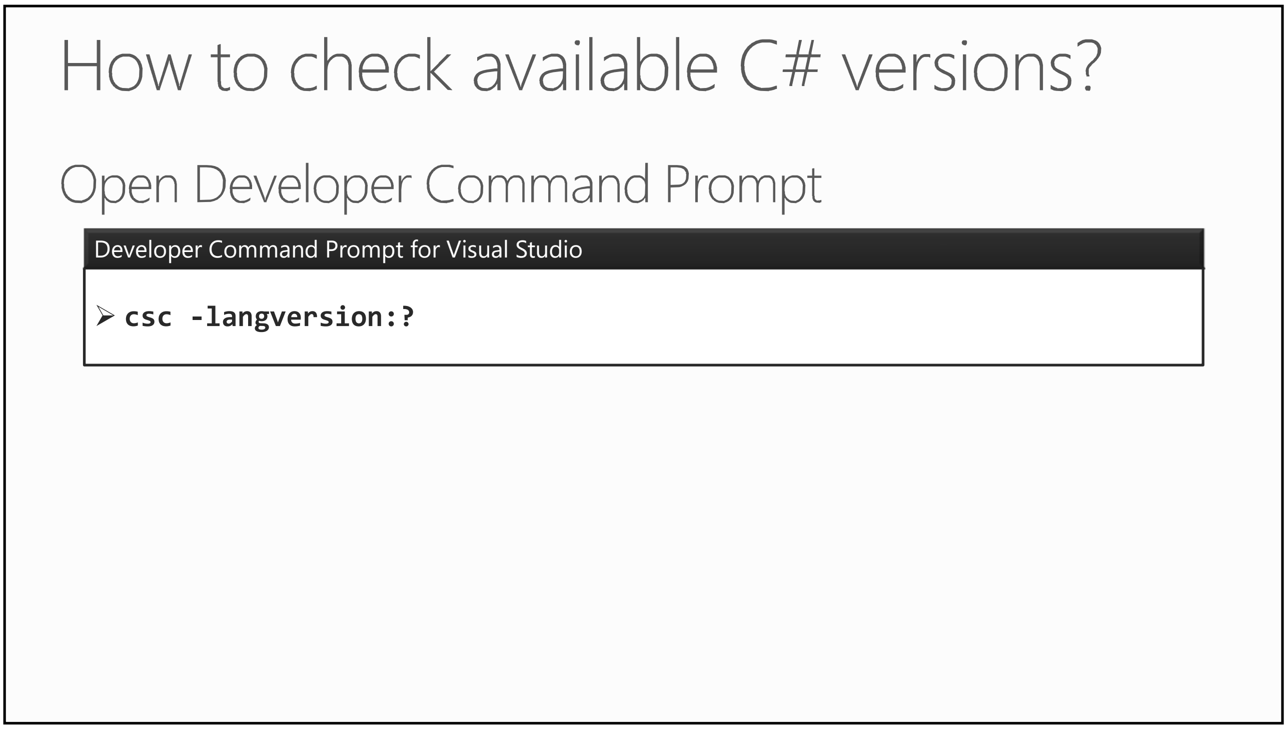
☐ Check for arithmetic overflow/underflow

Output

Debugging information: Full

File alignment: 512

Library base address: 0x00400000



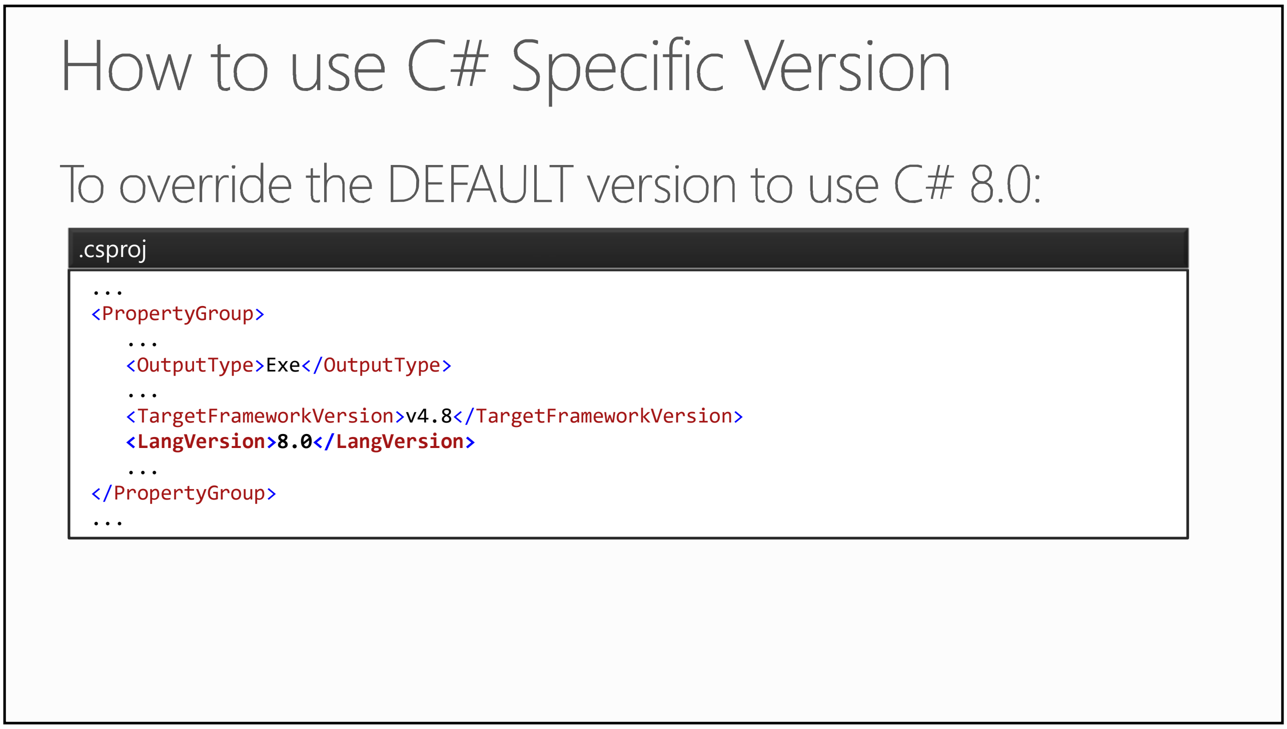
How to check available C# versions?

Open Developer Command Prompt

Developer Command Prompt for Visual Studio

```
➢ csc -langversion:?
```

43



How to use C# Specific Version

To override the DEFAULT version to use C# 8.0:

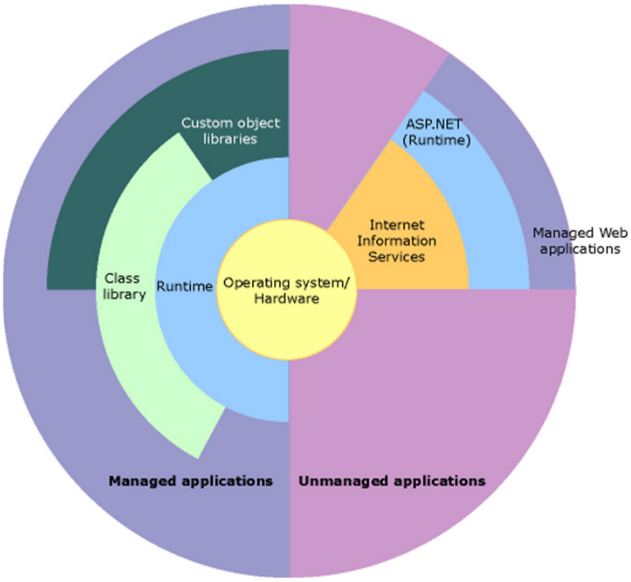
.csproj

```
...
<PropertyGroup>
   ...
   <OutputType>Exe</OutputType>
   ...
   <TargetFrameworkVersion>v4.8</TargetFrameworkVersion>
   <LangVersion>8.0</LangVersion>
   ...
</PropertyGroup>
...
```

44

So, what is ASP.NET?

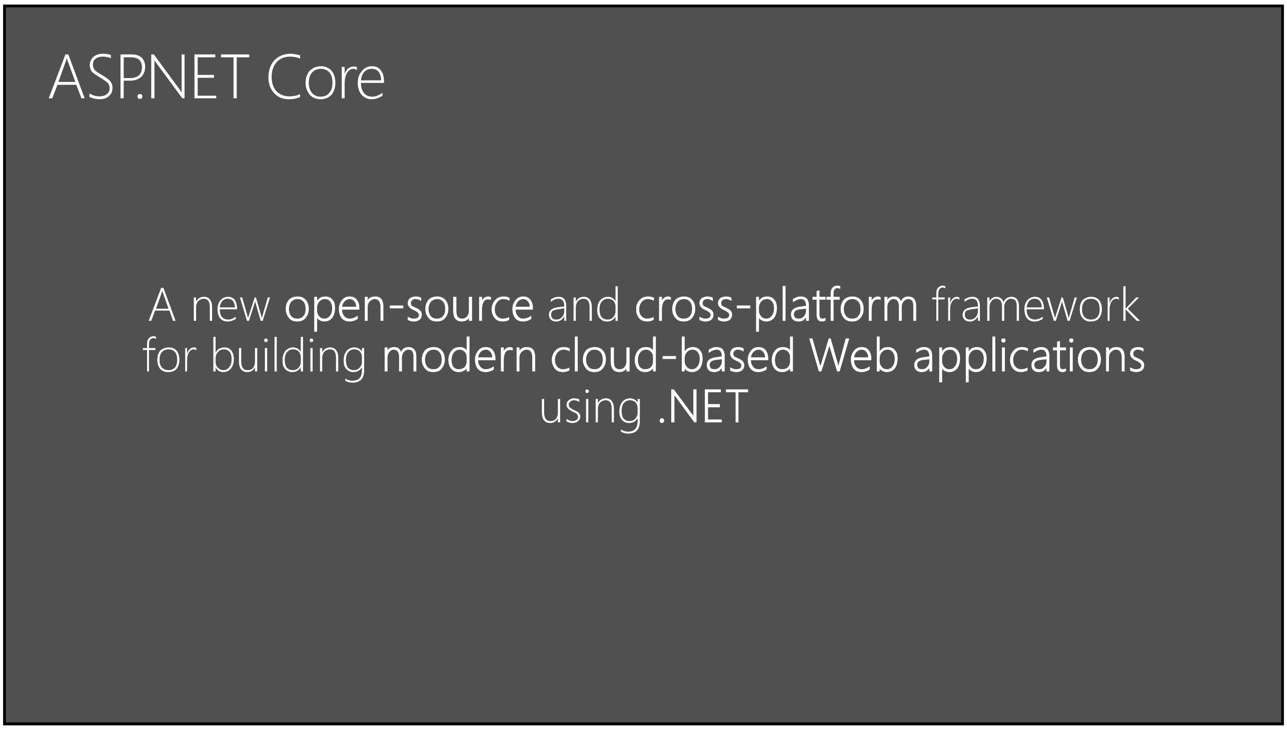
ASP.NET



.NET Compatible Systems

.NET Enabled Systems

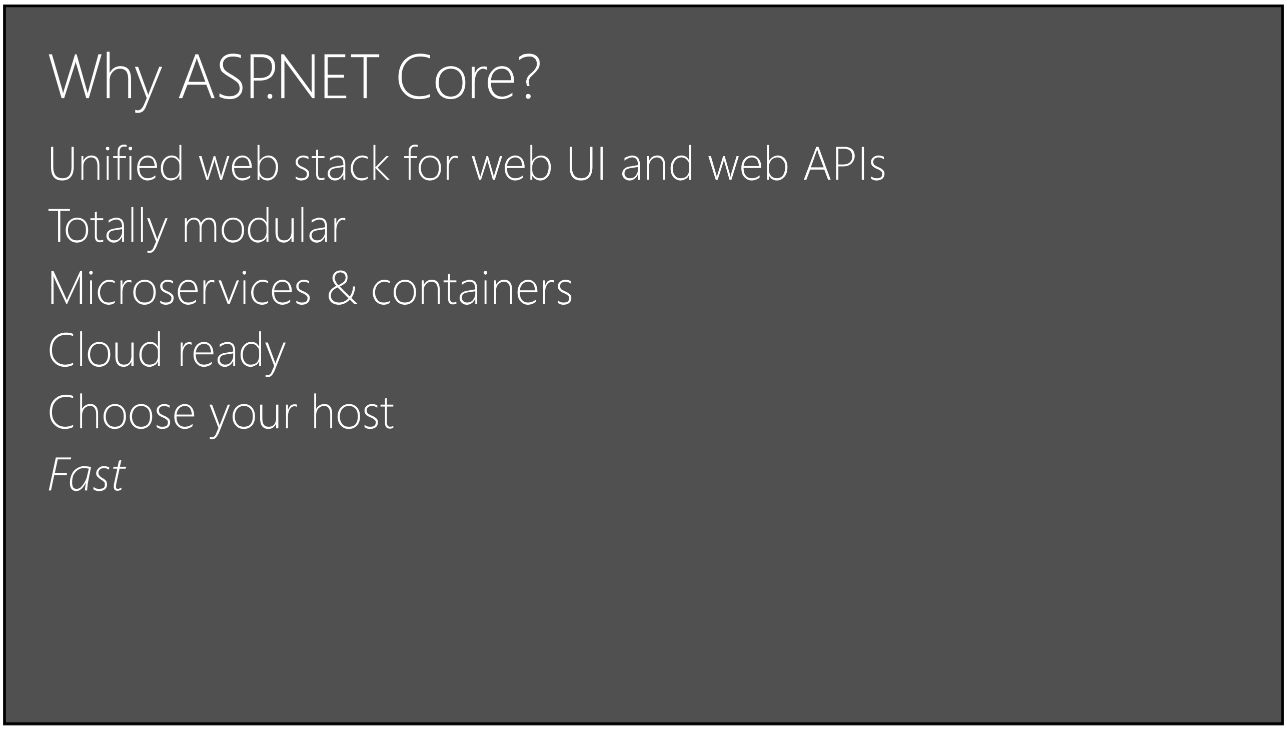
Kestrel Vs IIS



ASP.NET Core

A new **open-source** and **cross-platform** framework for building **modern cloud-based Web applications** using **.NET**

47



Why ASP.NET Core?

Unified web stack for web UI and web APIs

Totally modular

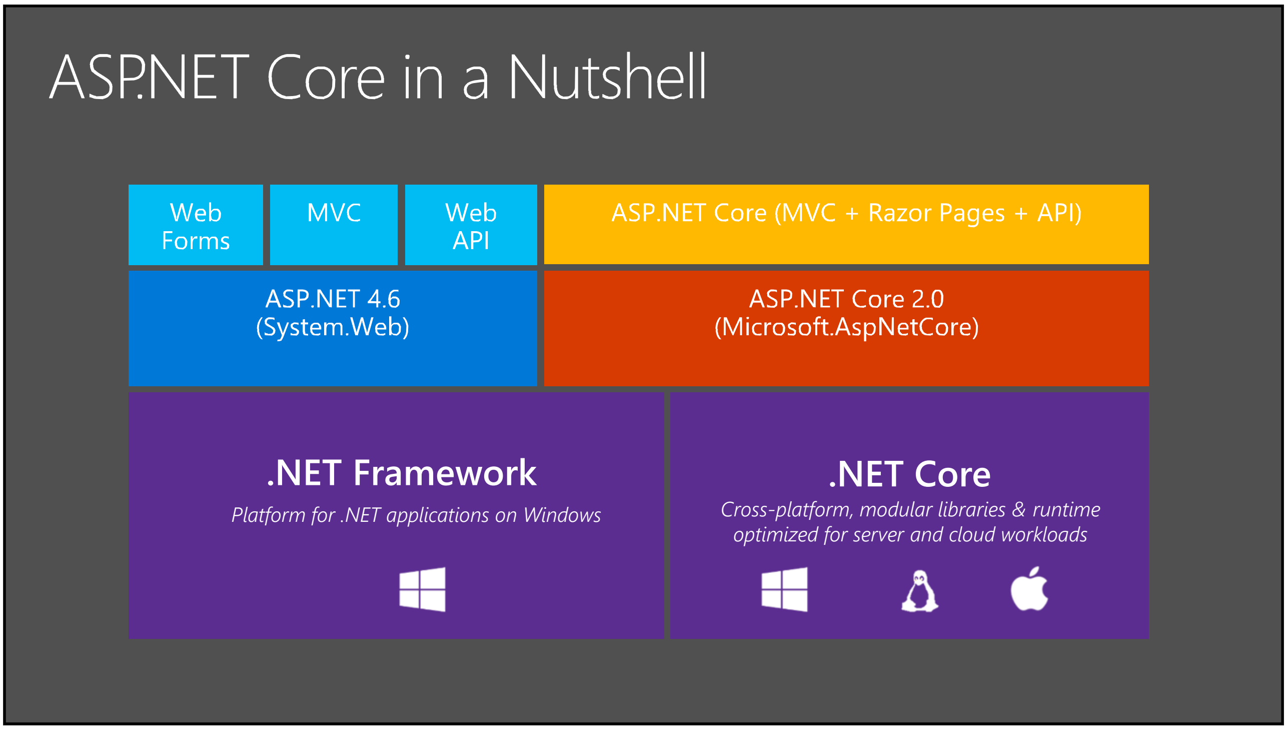
Microservices & containers

Cloud ready

Choose your host

Fast

48



ASP.NET Core in a Nutshell

Web Forms

MVC

Web API

ASP.NET Core (MVC + Razor Pages + API)

ASP.NET 4.6
(System.Web)

ASP.NET Core 2.0
(Microsoft.AspNetCore)

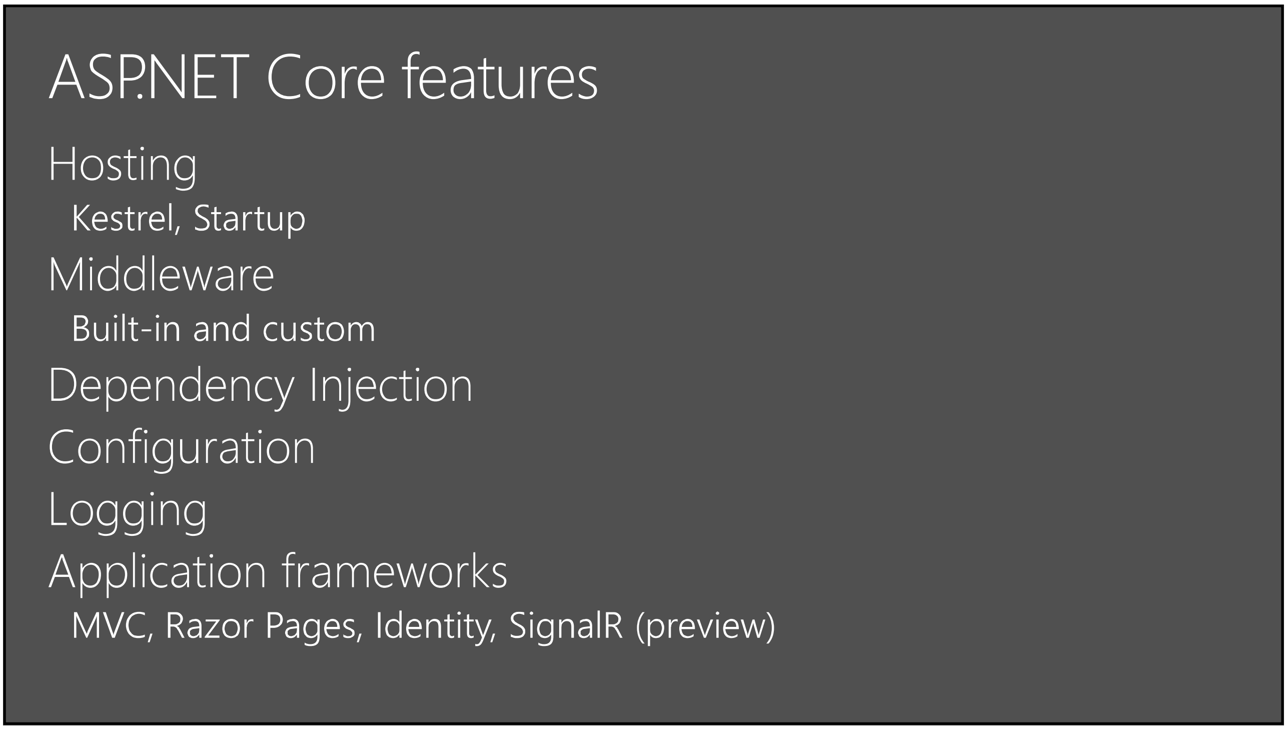
.NET Framework

Platform for .NET applications on Windows

.NET Core

Cross-platform, modular libraries & runtime optimized for server and cloud workloads

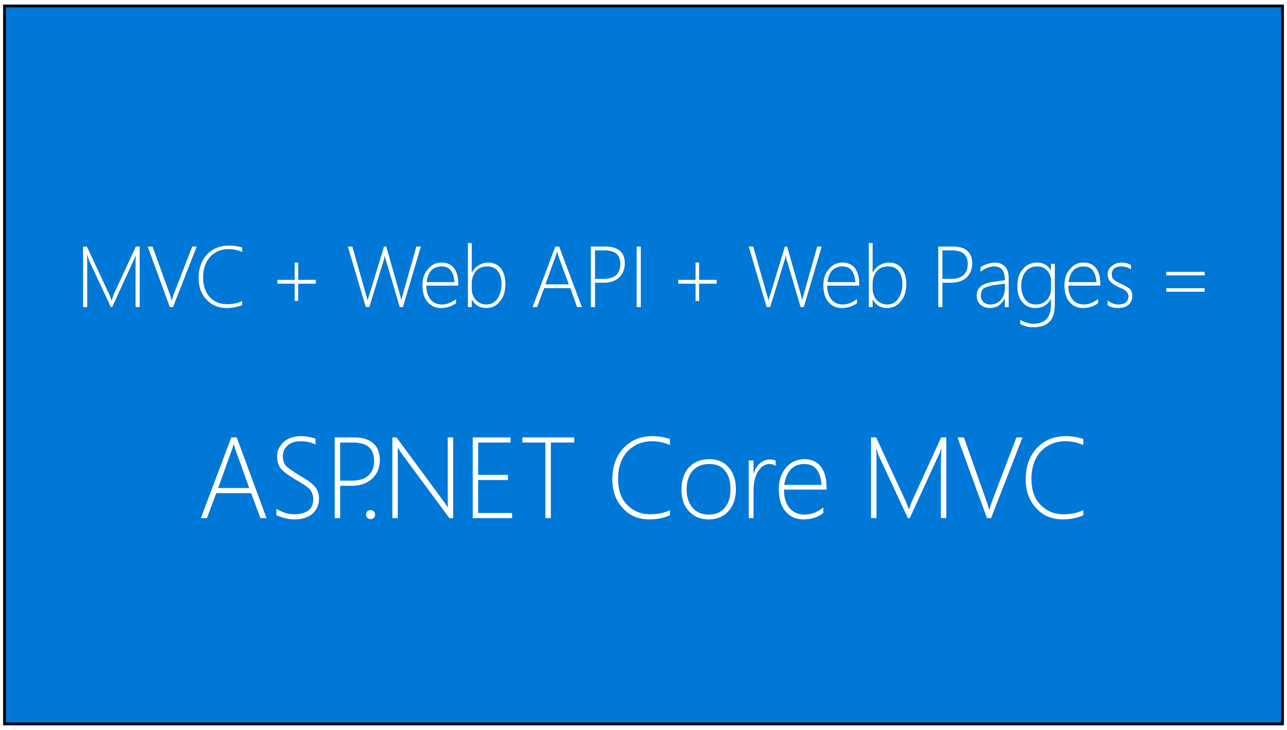
49



ASP.NET Core features

- Hosting
  - Kestrel, Startup
- Middleware
  - Built-in and custom
- Dependency Injection
- Configuration
- Logging
- Application frameworks
  - MVC, Razor Pages, Identity, SignalR (preview)

50



MVC + Web API + Web Pages =

ASP.NET Core MVC

51

MANOJ KUMAR SHARMA
Developer Evangelist - .NET & Web Technologies
mailme@manojkumarsharma.com

Thank You

Microsoft | developer & platform **evangelism**

52